

Anatomy



FOR MEDICAL STUDENTS

DR. M. M. PALIT
M.B.B.S.



A N A T O M Y

FOR MEDICAL STUDENTS

PART I
EXTREMITIES



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FOREWORD

I have read with interest Dr. Palit's first part of *Anatomy in Questions and Answers (Extremities)* in manuscript form.

The author has considerably improved the standard of answer relating to the subjects of Extremities on which questions are generally set in the various medical colleges in the country.

Dr. Palit has also covered a number of other subjects. This volume is definitely broad-based and shows substantial improvement.

I am confident that this book will be greatly welcomed by the medical students with the reduced four and a half years course as recommended by the Indian Medical Council.

I can confidently recommend this book to the medical students, particularly when they are busy revising and preparing for their examination.

In the end, I wish the author will continue to complete the series of the second and third parts of *Anatomy in Questions and Answers*.

A. C. DAS

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REVIEW

The merit of this book lies in the generosity and labour with which the author, as a well-wisher of his students, has tried to hunt out and pick up the right sort of food or material for the particular type of students.

The book is based on the author's personal experience as a teacher in the subject of Anatomy for the last over 15 years.

The author of this book, in arranging the subject matter in the form of questions and answers, has endeavoured to simplify the complicated subject and I confidently believe that the students interested in studying medicine in the country will derive ample of benefit by it.

The addition of diagrammatic illustration to this book has greatly enhanced the academic value of this book and I am sure it will prove useful for the medical students.

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PREFACE TO THE THIRD EDITION

The author thankfully acknowledges the appreciation he has received from the medical students in the constant increase of the demand of his book "Anatomy in Questions and Answers for Medical Students" Part I.

Since the first edition has gone out of print, he has undertaken to bring out its enlarged and revised edition which, he trusts, will serve the need of the medical students in a more befitting manner than its previous edition. The author has also included joints of the Extremities with diagrams. In their interest he has paid particular attention to the inclusion of coloured diagrams in this edition which will undoubtedly enhance its utility.

In the end he offers grateful thanks to the *Prakashan Kendra, Lucknow* for bringing out of his second edition.

M. M. PALIT

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GENERAL FEATURES OF HUMAN SKELETON

Q. What is the vertebral column ? Describe briefly.

The vertebral column is made up of a series of vertebrae which are united to one another by intervertebral fibro-cartilages and ligaments. They are 33 in number and consist of 5 parts e. g. cervical, thoracic, lumbar, sacrum and coccyx.

1. Cervical—7
2. Thoracic—12
3. Lumbar—5
4. Sacrum—5 fused together to form one bone.
5. Coccyx—4 fused together to form one.

Vertebral Column

Q. Describe the vertebral column.

The vertebral column is the main support of the body. Each vertebra is separated by means of a fibro-cartilage which acts as a buffer and serves to deaden the effects of shocks or jerks produced in jumping or doing exercise.

These vertebrae helps in different movements of the body like bending backwards and forwards.

The cervical, thoracic and lumbar vertebrae are movable whereas the sacrum and coccyx are fused bones. They have certain characteristics in common.

Q. What are the characteristics of a typical vertebra ?

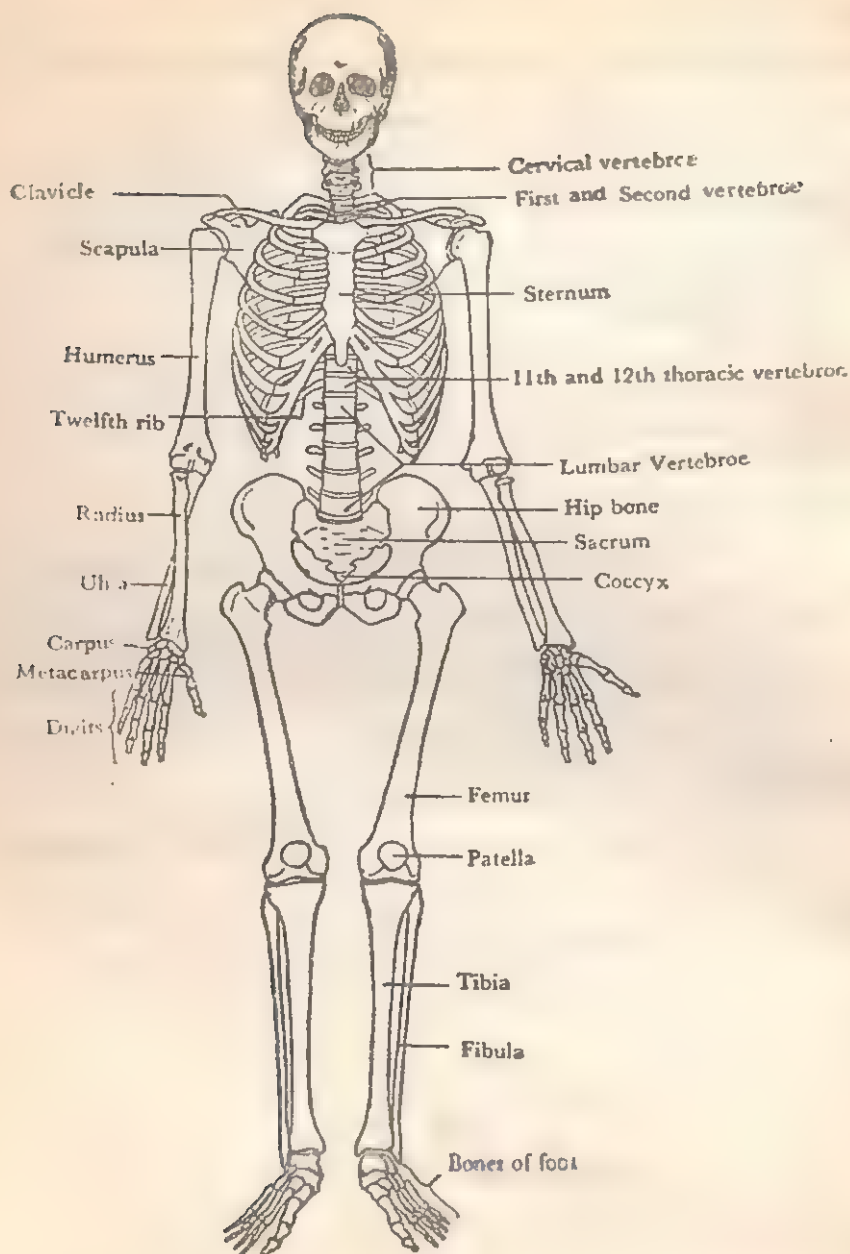
The common characteristic of a typical vertebra is best seen in mid-thoracic region.

Parts of a vertebra

1. Body

It is cylindrical in shape. Its anterior portion is bulky. It varies in size and shape in different regions.

Its superior and inferior surfaces are concave and are attached to each other by means of intervertebral discs. Its anterior surface is convex whereas the posterior surface is concave.



2 Pedicles

The pedicles are two horizontal bars which project back-

wards from the junctions of the lateral and posterior aspects of the body. The borders are concave.

3. Laminae

The laminae are two flat, broad plates which are jointed to each other at median plane to complete the neural arch and laterally with the pedicles.

The ligamentum flava is attached to their borders and the internal surfaces.

The pedicles and the laminae form the vertebral arch.

4. Vertebral foramen

The vertebral foramen is bounded by the vertebral arch and the posterior part of the body.

5. Spine

The spine springs backward from the junction of laminae at the midline. The spine projects backwards.

6. Transverse processes

The transverse processes are two lateral processes, situated at the junction of the pedicle and the lamina.

7. Articular processes

The articular processes are two, superior and inferior. They project upwards and downwards from the junction of the pedicle and the lamina. Their surfaces are smooth and articulate with the articular processes of contiguous vertebrae.

When the vertebrae are put together, the vertebral foramina form the vertebral canal for the lodgement of the spinal cord. The articular processes, the bodies and the discs of the vertebrae form a series of intervertebral foramina which transmit the spinal nerves and vessels.

Q. Describe the typical cervical vertebra.

The most important characteristics of the typical cervical vertebra are the following :—

1. Body

(i) Small in size.

(ii) Irregular in outline.

2. Pedicles

Short and rounded.

3. Laminae

(i) Long.

(ii) Narrow.

(iii) Sloping.

4. Vertebral foramen

(i) Large.

(ii) Triangular or semilunar.

5. Spine

(i) Short.

(ii) Forked or bifid at the ends for the attachment of muscles.

6. Transverse process

(i) Short.

(ii) Foramen present in their processes through which the vertebral arteries pass upwards to the brain.

(iii) Ends in two tubercles—anterior and posterior.

7. Articular facets of articular processes are circular.

Q. Describe the typical thoracic vertebra.

The following are the characteristics of a typical thoracic vertebra.

1. Body

(i) Heart-shaped.

(ii) Deeper behind than in front.

(iii) Presence of two costal facets, superior and inferior on the upper and lower margins of the posterior part of the side of the body.

(iv) Upper and lower surfaces flat.

(v) Anterior surface convex.

(vi) Posterior surface concave.

(vii) Superior costal facet larger than the inferior.

2. Pedicles

Short.

3. Laminae

(i) Broad.

(ii) Flat.

4. Vertebral foramen

(i) Circular.

(ii) Small.

5. Spines

(i) Long and slender.

(ii) Sloping.

(iii) Pointing downwards and overlapping each other.

6. Transverse process

(i) Thick.

(ii) Expanded at its free end and bears on its anterior surface a facet for articulation with the tubercle of the rib of corresponding number.

7. Articular surfaces of articular processes

(i) Flat.

(ii) Superior pair directed backwards whereas inferior pair forwards.

Q. Describe the typical lumbar vertebra.

The following are the chief characteristics of a typical lumbar vertebra.

1. Body

(i) Large.

(ii) Upper and lower surfaces are flat

(iii) Anterior surface convex.

2. Laminae

Thick and broad.

3. Vertebral foramen

(i) Large.

(ii) Triangular.

4. Spine

- (i) Horizontal.
- (ii) Large.
- (iii) Broad.
- (iv) Hatchet-shaped, with thickened posterior border

5. Transverse process

- (i) Long.
- (ii) Slender.
- (iii) Spatula-shaped.

6. Articular processes

Large, upper pair concave looking medially. Lower pair convex looking laterally.

7. Pedicles

Looking backwards.

Q. Give the distinguishing characteristics of the vertebrae of the various regions.

No.	Part of vertebrae	Cervical vertebrae	Dorsal vertebrae	Lumbar vertebrae	Sacral and coccygeal vertebrae
1	Body	(i) Small (ii) Irregular.	Heart-shaped There are facets on either side for the attachment of heads of ribs.	Large	In sacral and coccygeal region, the vertebrae do not keep their individual characteristics. They are fused together to form two distinct bones, the sacrum and coccyx.
2	Pedicles	(i) Short	Short	Looking backwards.	

		(ii) Rounded		
3	Laminae	(i) Long	(i) Broad	(i) Thick
		(ii) Narrow.	(ii) Flat	(ii) Broad
		(iii) Sloping.		
4	Vertebral foramen	(i) Large	(i) Circular	(i) Large
		(ii) Triangular	(ii) Small	(ii) Triangular
5	Spinous process	(i) Small	(i) Long	(i) Thick
		(ii) Bifid or forked.	(ii) Slender	(ii) Strong
			(iii) Turned downwards	(iii) Axe-shaped
			(iv) Sloping downwards	(iv) Turned downwards
				(v) Broad
6	Transverse processes	(i) Short	Large with facets at the tips for the attachment of ribs of corresponding number	Small and thick
		(ii) Foramina present for the vertebral artery and plexus of veins.		
7	Articular surfaces of articular processes.	Circular	Flat. Superior pair directed backwards. Inferior pair forwards.	Large Upper pair concave look medially. Lower pair convex, looking laterally

Q. What is sternum ? Describe briefly.

The sternum is situated in the middle of the thorax and is a dagger-like bone and first seven ribs are articulated on each side of the sternum by means of cartilages. The upper end of the sternum is articulated with the clavicle on each side. It consists of three parts e. g. the manubrium, the body and the xiphoid process.

Q. What are ribs ? Describe briefly.

The ribs are elastic arches of bones. They are connected posteriorly with the vertebral column and anteriorly with the sternum by means of cartilages. They form the framework of the thorax. They are 12 in number on each side. The first seven are true ribs and articulate directly with the sternum by means of costal cartilages. The rest five are false ribs because they do not articulate with the sternum directly by means of costal cartilages. The last 11th and 12th are floating ribs because they are free at their anterior ends.

Q. What is skull ? Name the bones which form the skull.

The skull is situated on the top of the vertebral column (the atlas) It is divided into the cranium and the face.

1. **Cranium**—It is made up of eight bones and contains the brain. The bones are united together forming a suture.

The following are the bones of the cranium :—

- (i) Occipital—1
- (ii) Parietals—2
- (iii) Frontal—1
- (iv) Temporals—2
- (v) Sphenoid—1
- (vi) Ethmoid—1

(i) Occipital—The occipital bone is situated at the back of the head or skull and is united above with the two parietal bones

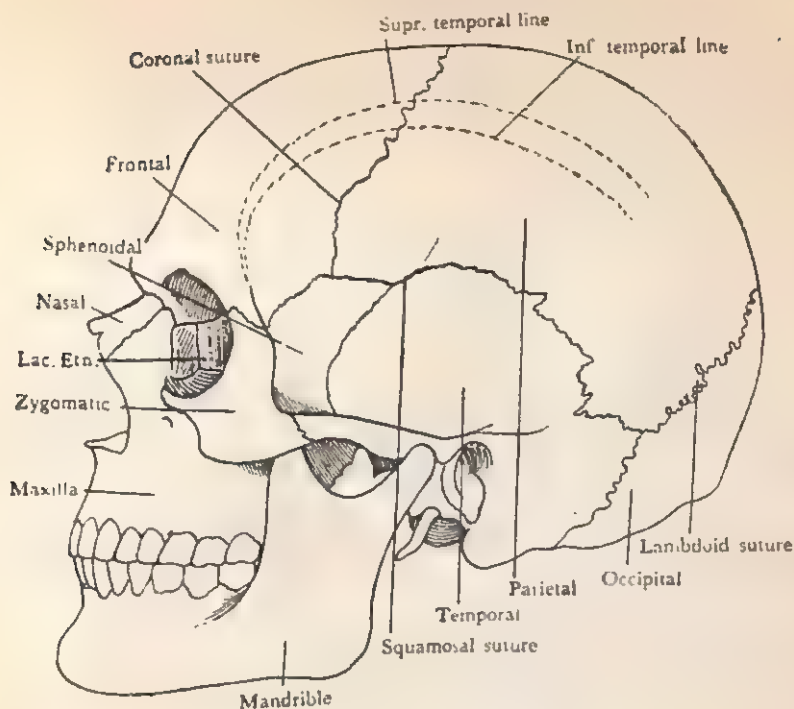


Fig. 1. The skull (Lateral View).

It has a big hole at the base and is known as foramen magnum through which the spinal cord passes.

(ii) **Parietals**—There are two parietal bones which are situated on the side and the roof of the head or skull, and they are united with the frontal bone anteriorly and with occipital bone posteriorly.

(iii) **Frontal**—The frontal bone forms the forehead, the root of the orbit and the upper portion of the nose.

(iv) **Temporal**—The two temporal bones form the side wall of the skull. These bones contain a narrow canal leading to the middle ear.

(v) **Sphenoid**—The sphenoid bone is a bat-like bone. It has two wings, greater and smaller. It unites behind with the temporal bones on the sides and its body with the basilar part of the occipital bone.

(vi) **Ethmoid**—The ethmoid bone is situated in front of the sphenoid forming the roof of the nose and the part of the side walls of the orbit.

2. Face—It consists of 14 bones:—

- (i) Maxilla—2
- (ii) Zygomatics—2
- (iii) Nasals—2
- (iv) Lacrimals—2
- (v) Inferior Nasal Conchae—2
- (vi) Palatine bones—2
- (vii) Vomer—1
- (viii) Mandible—1

Maxillae—It is the bone of the upper jaw and a portion of the roof of the mouth. There are eight sockets for teeth on each side.

Mandible—It is the bone of the lower jaw. It has 16 sockets for teeth.

Zygomatics—They form the prominence of the cheek.

Palatines—They form the posterior part of the palate.

Nasal bones—They form the upper part of the bridge of the nose.

Inferior Nasal Conchae—They are present on each side of the nose.

Lacrimals—They are situated on each side of the medial wall of the orbit.

Vomer—It forms the back part of the middle portion of the nose.

Q. What are the bones of the upper extremity ?

The following are the bones of the upper extremity :—

- (i) Clavicle or collar bone.
- (ii) Scapula.
- (iii) Humerus or Arm bone.
- (iv) Radius }
- (v) Ulna } or Forearm bones.
- (vi) Carpal or wrist bones.

- (vii) Metacarpal or bones of the palm.
- (viii) Phalanges or bones of the digits.

Q. What are the bones of the hand ?

1. The carpal bones are 8 in number and arranged in two rows viz :—

First row (from the radial to the ulnar side):—

- (i) Navicular or Scaphoid
- (ii) Lunate
- (iii) Triquetral
- (iv) Pisiform

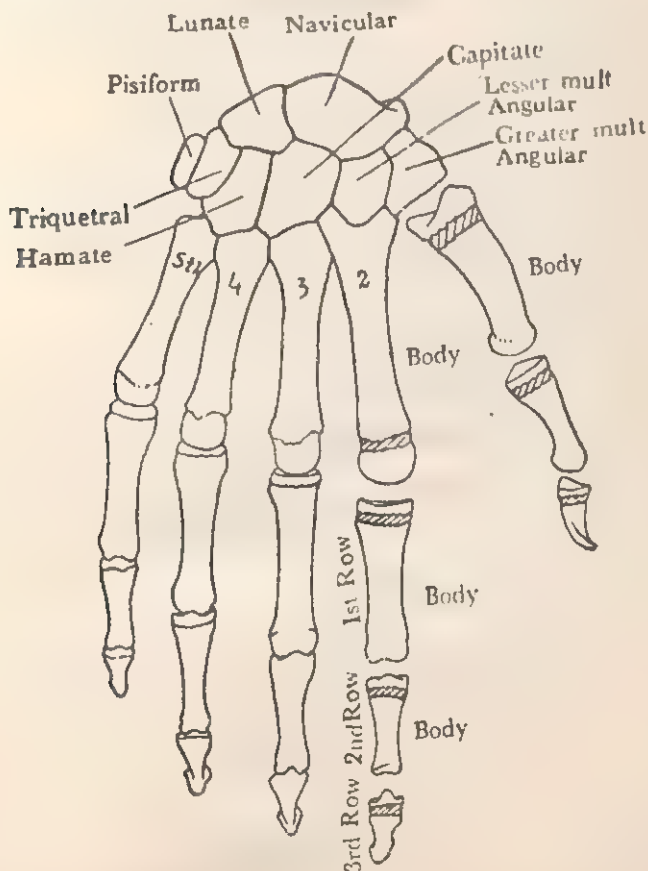


Fig. 2. Bones of the hand.

Second row (from the radial to the ulnar side):—

- (i) Greater multangular. (Trapezium)
- (ii) Lesser multangular. (Trapezoid).
- (iii) Capitate.
- (iv) Hamate.

Metacarpal bones—5

Phalanges—14

See Fig. 2 (Bones of the Hand).

Q. What are the bones of the lower extremity ?

The following are the bones of the lower extremity
e. g. :—

- 1. Hip bone.
- 2. Femur or Thigh bone.
- 3. Tibia }
- 4. Fibula } or Leg bone.
- 5. Patella or Knee cap.
- 6. Tarsal.
- 7. Meta Tarsal.
- 8. Phalanges or bones of the digits.

Q. What are the bones of the foot ?

Tarsal :— 7 in number :

- 1. Talus.
- 2. Calcaneum.
- 3. Navicular.
- 4. First cuneiform.
- 5. Second cuneiform.
- 6. Third cuneiform.
- 7. Cuboid.

Metatarsal—5

Phalanges—14

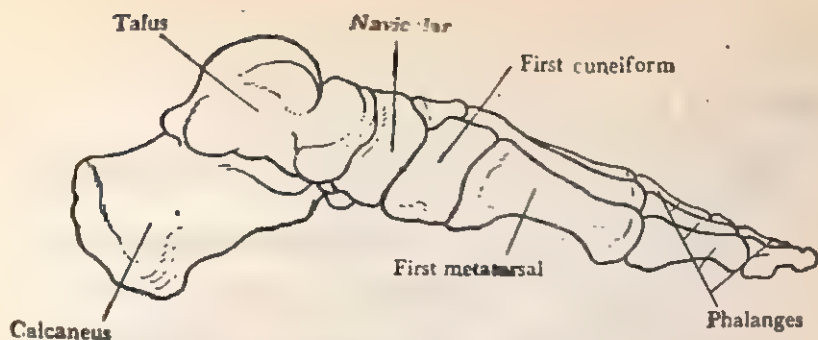


Fig. 3. Medial aspect of the bones of the left foot.

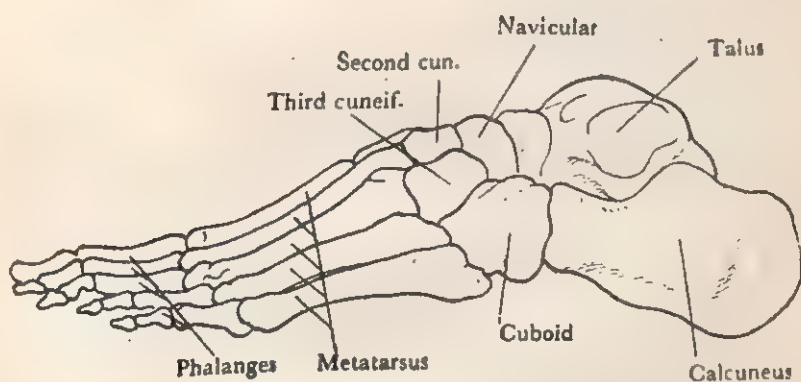


Fig. 4. Lateral aspect of the bones of the left foot.

CLAVICLE

Q. Describe the medial 2/3rd of the clavicle. (Homoeopathic Board, 1965)

The medial 2/3rd of the clavicle is prismoid in shape. It has got four borders and four surfaces.

1. Antero-Superior.
2. Antero-Inferior.
3. Postero-Superior.
4. Postero-Inferior.

The anterior border of the lateral 1/3rd of the clavicle divides into an antero-superior and an antero-inferior borders. The space between them is the anterior surface.

The posterior border of the lateral 1/3rd of the clavicle divides into postero-superior and postero-inferior borders.

The surface between the antero-superior and postero-superior borders forms the superior surface or upper surface.

The surface between the postero-superior and postero-inferior borders forms the posterior surface.

The surface between the antero-inferior and postero-inferior borders forms the inferior surface.

Surfaces :—

Anterior Surface—It is rough and gives origin to the clavicular head of the pectoralis major muscle.

Superior Surface or Upper Surface—It is rough and gives origin to the clavicular head of the sterno-mastoid muscle.

Posterior Surface—

It is smooth and does not give any muscular attachment except, near the sternal end, the sterno-hyoid muscle takes origin. Medially it is related to the big vessels and nerves e. g. internal jugular vein, transverse scapular vessels, brachial plexus and subclavian vessels.

Inferior Surface :—

It gives insertion to the subclavian muscle in the subclavian groove. Costal tuberosity is situated on the medial side for the attachment of the costo-clavicular ligament.

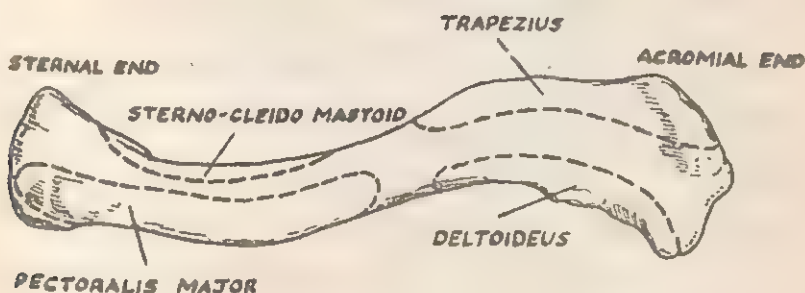


Fig. 5. The left clavicle. Superior aspect.

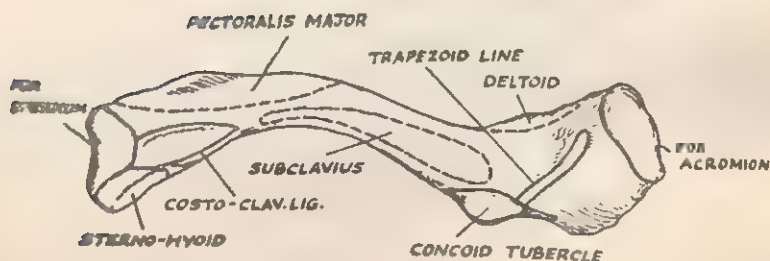


Fig. 6. The left clavicle. Inferior aspect.

Q. Describe the lateral one-third of the clavicle.

The lateral one-third of the clavicle is flat. It has two surfaces, upper and lower, and two borders, anterior and posterior.

Surfaces**Upper surface**

The upper surface is flat and rough. It gives attachment to the deltoid in front and trapezius behind.

Lower surface

The lower surface is also flat and does not give any muscular attachment. It presents two markings close to the posterior border. At the junction of the lateral one-third with the rest of the bone, there is a tubercle known as the conoid tubercle which gives attachment to the conoid part of the coraco-clavicular ligament. From the lateral side of the tubercle, a ridge runs forwards and laterally reaching as far as the acromial end. This ridge is known as the trapezoid ridge which gives attachment to the trapezoid part of the coraco-clavicular ligament.

Borders**Anterior border**

The anterior border is concave and gives origin to the deltoid muscle.

Posterior border

The posterior border is convex and gives insertion on the trapezius.

THE SCAPULA**Q. Describe the surfaces of the scapula.**

The scapula is a large, flat triangular bone. It is situated on the postero-lateral side of the chestwall and extends from the second to the seventh ribs.

It has two surfaces, costal or anterior and dorsal.

Anterior or Costal Surface

The anterior or costal surface is concave and is known as the subscapular fossa which gives origin to the subscapularis muscle.

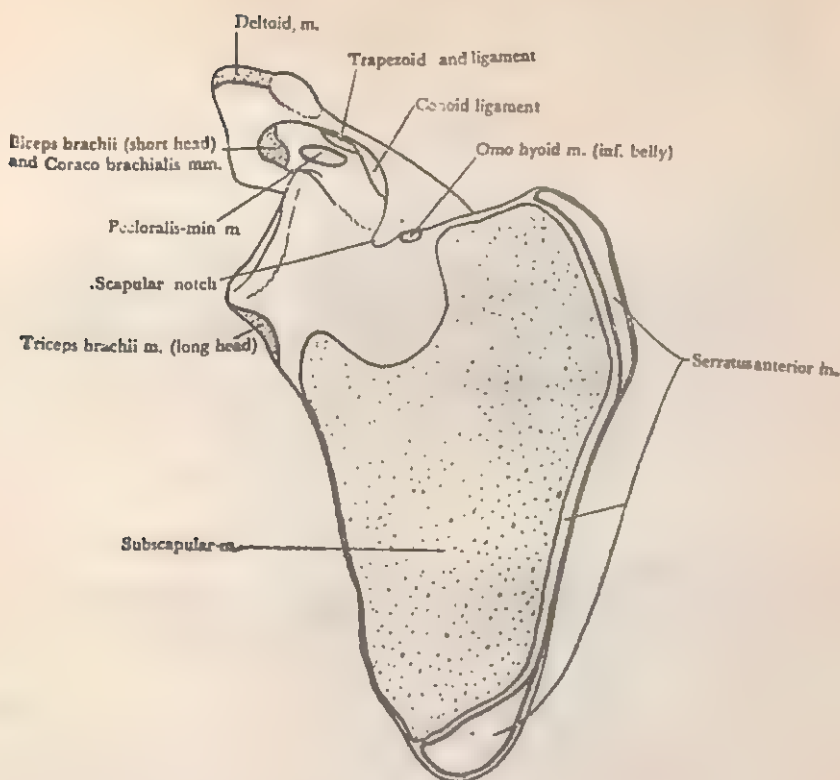


Fig. 7. The costal surface of the scapula.

Near the inferior angle there is an oval area which gives insertion to the lower five or six digitations of the serratus anterior.

Dorsal surface

The dorsal surface is convex. It is sub-divided into two fossae by means of a spine. The fossa above the spine is known as the supra-spinatus fossa which gives origin to the supra-spinatus muscle. The fossa below the spine is known as the infra-spinatus fossa which gives origin to the infra-spinatus muscle.

From the lower part of the glenoid cavity there is an elevated ridge which runs downwards and backwards and reaches above the inferior angle. The surface between the ridge and the axillary border gives origin to the teres minor above and the teres major

below. There is a groove between the muscles for the passage of the circumflex scapular vessels which enter the infra-spinatus fossa

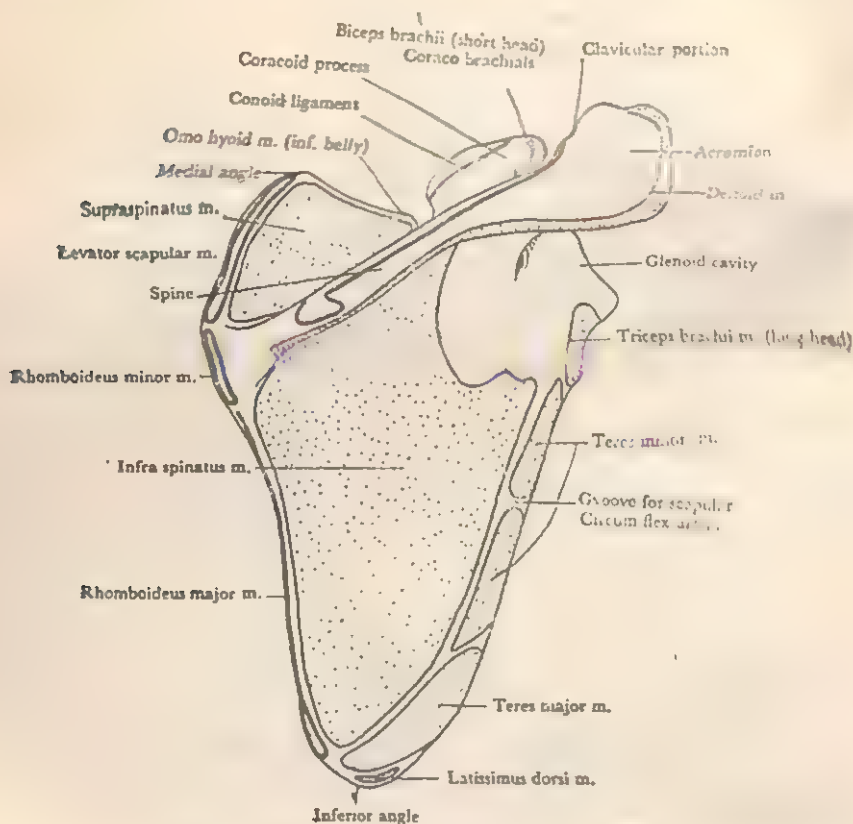


Fig. 8. The dorsal surface of the scapula.

Q. What are the borders of the scapula? Describe them.

There are three borders of the scapula—superior or upper, lateral or axillary and medial or vertebral.

Superior or upper border

The superior or upper border is thin and sharp. It extends from the superior or medial angle to the base of the coracoid process. There is a supra-scapular notch which is converted into

a foramen by the supra-scapular ligament. It transmits the supra-scapular nerve to the supra-spinatus fossa and the supra-scapular vessels pass above the ligament. Near the supra-scapular notch, the inferior belly of the omohyoid muscle takes its origin.

Lateral or axillary border

The lateral or axillary border extends from the lower margin of the glenoid cavity to the inferior angle. Below the glenoid cavity is the infra-glenoid tuberosity which gives origin to the long head of the triceps brachii. This border also gives origin to the teres minor above and the teres major below.

Above the glenoid cavity is the supra-glenoid tuberosity for the origin of the long head of the biceps brachii.

Medial or vertebral border

The medial or vertebral border extends from the superior or medial angle to the inferior angle. It is thin. The portion extending from the superior angle to the root of the spine gives insertion to the levator scapulae muscle. Below and opposite the root of the spine the rhomboideus minor is inserted. The remaining portion of the border i. e. below the root of the spine gives insertion to the rhomboideus major.

On the costal surface of the scapula the serratus anterior is inserted.

Q. Write short notes on the following :—

- (i) Spine of the scapula.
 - (ii) Acromion Process.
 - (iii) Coracoid Process.
- (i) Spine of the scapula

The spine of the scapula is triangular in shape and is situated on the dorsal surface of the scapula. Its lateral border is free, thick and rounded and helps to form the spino-glenoid notch.

Its anterior border is attached to the dorsal surface of the scapula. The third border is known as the crest of the spine and

potent, and often also among the most tragic (though sometimes, too, the most absurd), that beset humanity and fight against its happiness and progress. To illustrate this from two examples that have come within my own experience: A young woman felt it to be her duty to enter the profession of architecture, not only because this seemed in harmony with her personal interests and ideals but because she was the daughter of a family that could boast of a considerable number of successful architects. This conscious choice was suggested by a dream.

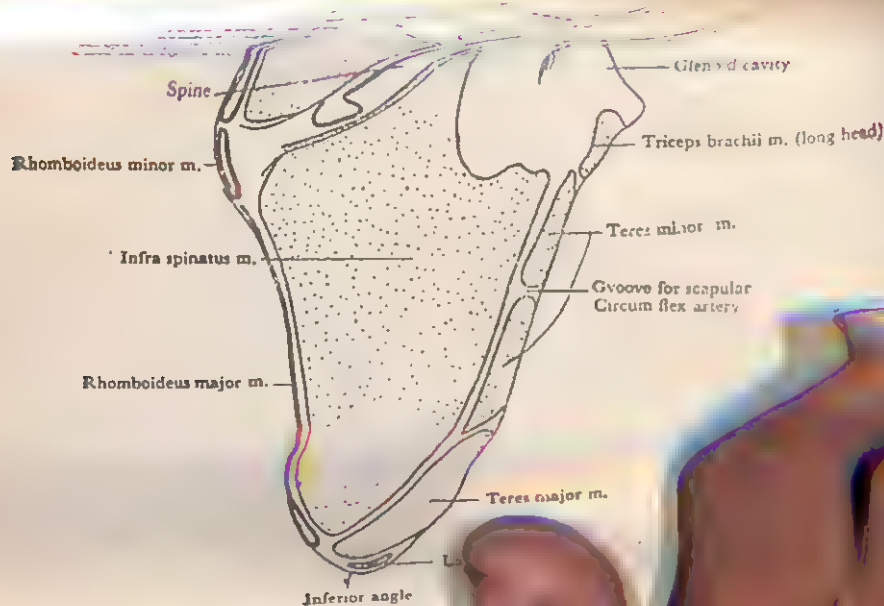


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Superior or upper border

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ligament. It transmits the *infra-glenoid fossa* and the *supra-glenoid fossa*. The *supra-scapular* *artery* and *vein* pass over its origin.

The *axillary border* extends from the lower margin of the *glenoid cavity* to the *inferior angle*. Below the *glenoid cavity* is the *infra-glenoid tuberosity* which gives origin to the *long head of the triceps brachii*. This border also gives origin to the *teres minor* above and the *teres major* below.

Above the *glenoid cavity* is the *supra-glenoid tuberosity* for the origin of the *long head of the biceps brachii*.

Medial or vertebral border

The *medial or vertebral border* extends from the *superior or medial angle* to the *inferior angle*. It is thin. The portion extending from the *superior angle* to the *root of the spine* gives origin to the *levator scapulae* muscle. Below this and opposite the *root of the spine* the *teres minor* is inserted. The *teres major* is inserted below the *root of the spine*.

Of the *vertebral border* the *scapula*

the following :—

The *scapula* is in shape and is situated *in the scapular girdle*. Its *border* is free, *thick and rounded*.

Its *anterior border* is *concave*. The *third border* is known as the *inferior border*. The *scapula* is *triangular* in shape and is situated *in the scapular girdle*.

below. There is a groove between the muscles for the passage of the circumflex scapular vessels which enter the infra-spinatus fossa

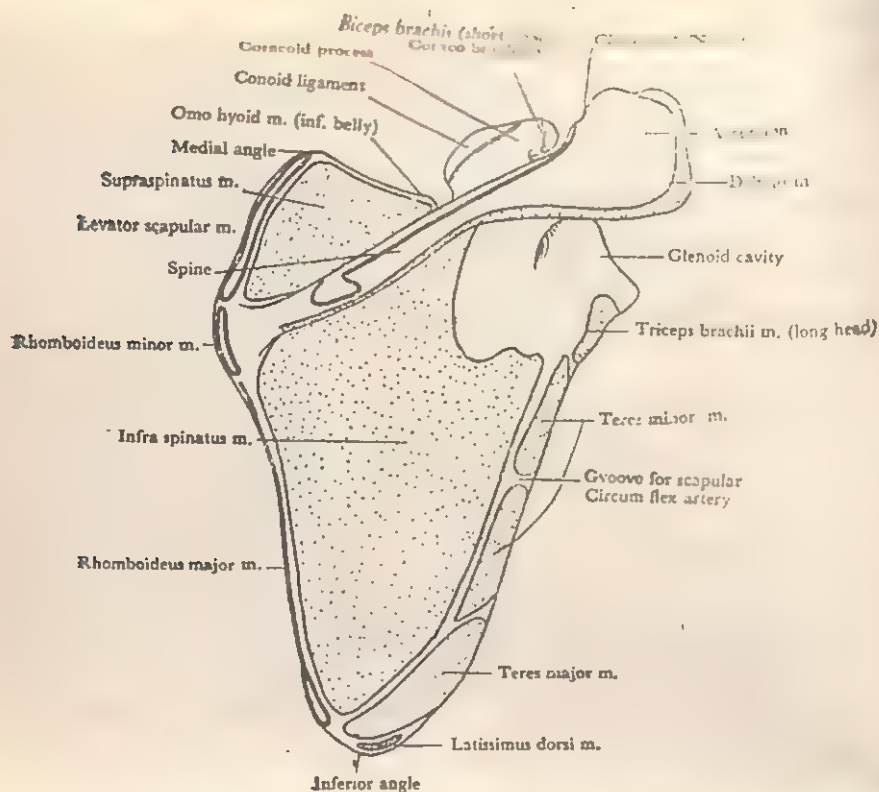


Fig. 8. The dorsal surface of the scapula.

Q. What are the borders of the scapula? Describe them.

There are three borders of the scapula—superior or upper, lateral or axillary and medial or vertebral.

Superior or upper border

The superior or upper border is thin and sharp. It extends from the superior or medial angle to the base of the coracoid process. There is a supra-scapular notch which is converted into

a foramen by the supra-scapular ligament. It transmits the supra-scapular nerve to the supra-spinatus fossa and the supra-scapular vessels pass above the ligament. Near the supra-scapular notch, the inferior belly of the omohyoid muscle takes its origin.

Lateral or axillary border

The lateral or axillary border extends from the lower margin of the glenoid cavity to the inferior angle. Below the glenoid cavity is the infra-glenoid tuberosity which gives origin to the long head of the triceps brachii. This border also gives origin to the teres minor above and the teres major below.

Above the glenoid cavity is the supra-glenoid tuberosity for the origin of the long head of the biceps brachii.

Medial or vertebral border

The medial or vertebral border extends from the superior or medial angle to the inferior angle. It is thin. The portion extending from the superior angle to the root of the spine gives insertion to the levator scapulae muscle. Below this and opposite the root of the spine, the rhomboideus minor is inserted. The remaining portion of the border *i. e.* below the root of the spine, gives insertion to the rhomboideus major.

On the costal surface of the vertebral border the serratus anterior is inserted.

Q. Write short notes on the following :—

(i) Spine of the scapula.

(ii) Acromion Process.

(iii) Coracoid Process.

(i) Spine of the scapula

The spine of the scapula is triangular in shape and is situated on the dorsal surface of the scapula. Its lateral border is free, thick and rounded and helps to form the spino-glenoid notch.

Its anterior border is attached to the dorsal surface of the scapula. The third border is known as the crest of the spine and

is subcutaneous. At its medial end, the crest expands into a smooth triangular area. The spine of the scapula gives origin by its upper surface to the supra-spinatus muscle, and the lower surface to the infra-spinatus muscle. The lower border of the crest gives origin to the deltoid muscle and the upper border of the crest gives insertion to the trapezius.

(ii) Acromion process

The acromion process of the scapula projects from the lateral end of the spine. The lower border of the crest of the spine is continuous with the lateral border of acromion process at the acromion angle, and the upper border of the crest of the spine is continuous to the medial border of the acromion process. It is short. There is an oval facet for articulation with the clavicle. The medial border gives insertion to the trapezius muscle and the lateral border gives origin to the deltoid muscle.

(iii) Coracoid process

The coracoid process of the scapula is a thick curved process and is situated on the upper border of the head of the scapula. It is bent sharply and projects forwards and laterally. There is an impression on the dorsal aspect of the coracoid process which gives attachment to the conoid part of the coraco-clavicular ligament.

The trapezoid part is attached to the upper aspect of the horizontal part of the process. The superior aspect of the process receives the insertion of the pectoralis minor. Its lateral border gives attachment to the coraco-acromial ligament and below to the coraco-humeral ligament. The enlarged tip of the process gives origin to the coraco-brachialis medially and the short head of the biceps brachii laterally. Its anterior surface is crossed by the tendon of the subscapularis and its posterior surface by the tendon of the supra-spinatus.

THE HUMERUS

Q. Describe the upper end of the humerus.

The upper end of the humerus has a head, a greater tubercle and a lesser tubercle.

Head

The head of the humerus is hemispherical in shape. It is directed upwards, medialwards and backwards.

It articulates with the glenoid cavity of the scapula. The constriction below the head is known as the anatomical neck.

There is another constriction just below the tubercles known as the surgical neck where fracture generally takes place.

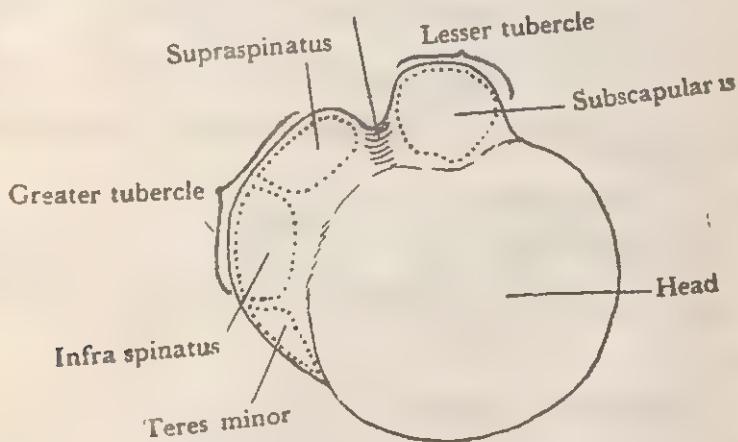


Fig. 9. The head of the humerus.

The anatomical neck gives attachment to the articular capsule of the shoulder joint. It is perforated by the foramina for nutrient blood vessels.

Greater tubercle

The greater tubercle is situated at the lateral side of the head and the lesser tubercle. It is convex and marked by three impressions—the upper impression gives insertion to the supraspinatus, the middle impression gives insertion to the infra-spinatus and the lower impression gives insertion to the teres minor.

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Lesser tubercle

The lesser tubercle is more prominent than the greater tubercle. It is situated in front. It is directed medialwards. It gives insertion to the tendon of the subscapularis.

Bicipital groove

The bicipital groove is situated between the two tubercles—greater and lesser. It lodges the tendon of the long head of the biceps brachii and transmits a branch of the anterior humeral circumflex artery to the shoulder joint. It also gives insertion to the latissimus dorsi. The lips of the bicipital groove are called the crests of the greater tubercle and the lesser tubercle. The crest of the greater tubercle forms the upper part of the anterior border of the body of the humerus and the crest of the lesser tubercle forms the upper part of the medial border of the body of the humerus.

Q. Describe the body of the humerus.

The body of the humerus is cylindrical in shape in the upper portion and triangular in shape in the lower portion. It has three borders and three surfaces.

Borders

The borders are anterior, lateral and medial.

Anterior border

The anterior border begins from the front of the greater tubercle above and ends at the coronoid fossa below. It separates the antero-medial from the antero-lateral surface.

Its upper portion is the crest of the greater tubercle (pectoral ridge) which gives insertion to the pectoralis major-muscle. Its middle portion forms the anterior boundary of a V-shaped impression (deltoid tuberosity) on the antero-lateral surface of the humerus. The lower portion of the border is smooth and round.

Lateral border

The lateral border of the humerus begins from the posterior portion of the greater tubercle and ends at the lateral epicondyle. It separates the antero-lateral from the posterior surface. Its

upper half gives insertion to the *teres minor* and origin to the lateral head of the *triceps brachii*.

Its middle portion has a shallow oblique depression known as the *sulcus nervi radialis* (musculo-spiral groove). The radial nerve and the *arteria profunda brachii* pass through the spiral groove.

Its lower portion forms a prominent ridge as lateral supra-condylar ridge which gives attachment to the lateral inter-muscular septum. The *brachio-radialis* takes origin from its upper two-thirds of the lateral supra-condylar ridge and the *extensor carpi radialis longus* takes origin from the lower one-third of the ridge.

Medial border

The medial border begins from the lesser tubercle and ends at the medial epicondyle. It separates the antero-medial from the posterior surface. Its upper part is the crest of the lesser tubercle (*teres ridge*) and gives insertion to the *teres major*.

Its middle portion has an impression which gives insertion to the *coraco-brachialis*.

The lower portion of the border forms the medial supra-condylar ridge which gives attachment to the medial intermuscular septum.

Surfaces

The body of the humerus has three surfaces—antero-lateral, antero medial and posterior.

Antero-lateral surface

The upper part of the antero-lateral surface is covered by the *deltoides* muscle. The middle portion of the surface has a V-shaped elevation known as *deltoid tuberosity*, which gives insertion to the *deltoides* muscle. Below the *deltoid tuberosity* is the *sulcus nerve radialis* (musculo-spiral groove) which transmits the radial nerve and *arteria profunda brachii*. The lower portion of the surface gives origin to the *brachialis* muscle.

Antero-medial surface

The upper part of the antero-medial surface forms the floor of the bicipital groove. It gives insertion to the latissimus dorsi. Its middle part has an impression which gives insertion to the coraco-brachialis.

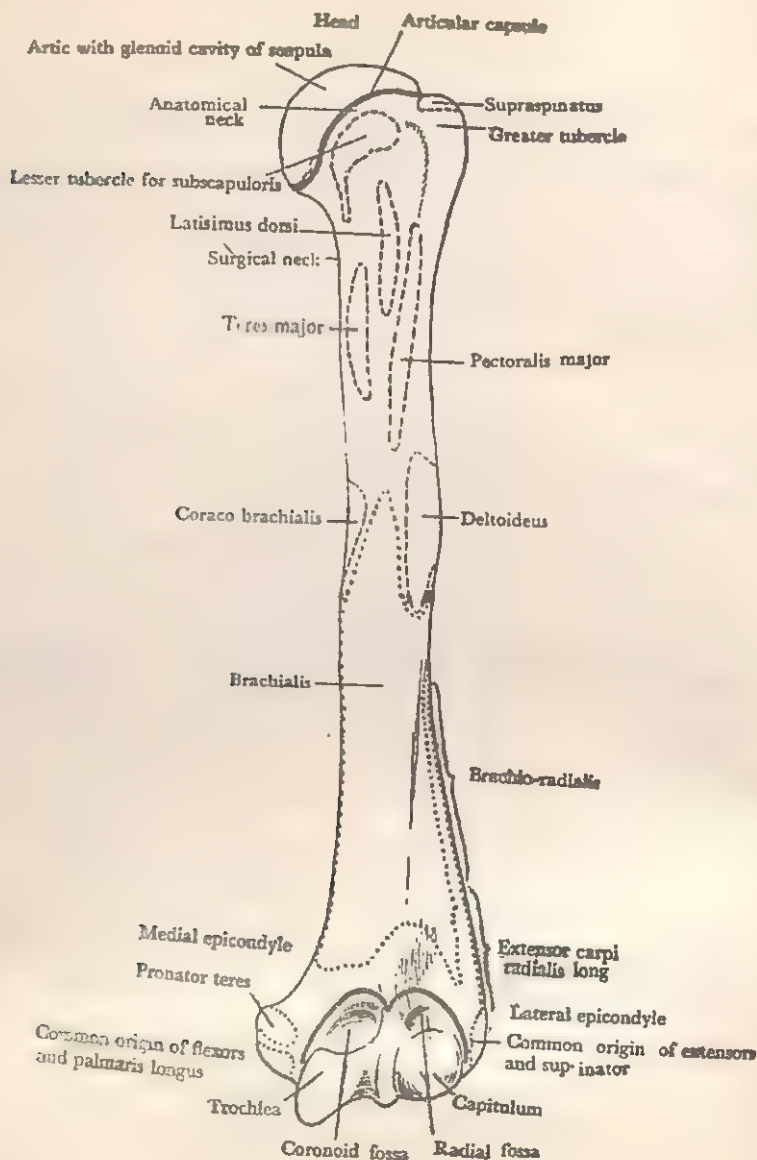


Fig. 10. Anterior surface of the humerus.

its lower portion is smooth and gives origin to the brachialis.

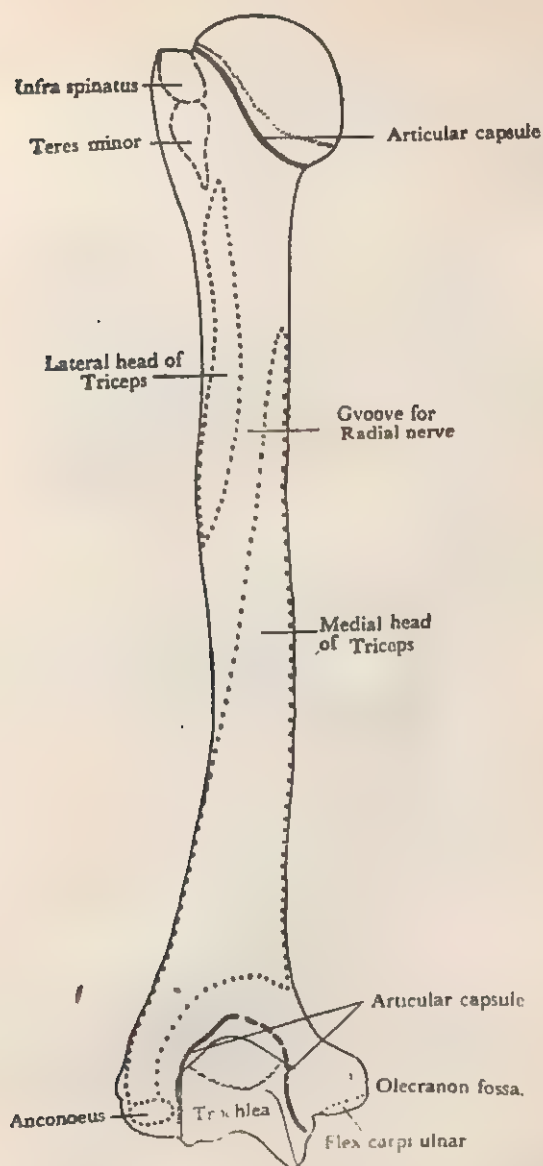


Fig. 11. Posterior surface of the humerus.

Posterior surface

The posterior surface of the body of the humerus is covered by the lateral and medial heads of the triceps brachii. The lateral head takes origin above the radial sulcus and the medial head of the triceps brachii takes origin below the radial sulcus.

Q. Describe the lower end of the humerus.

Lower end of humerus

The lower end of the humerus has two epicondyles, the medial and the lateral. On the inferior portion there is an articular surface which is divided by a vertical ridge into two portions, the lateral and the medial. The lateral portion is known as the capitulum and the medial portion is known as the trochlea.

In front and above the capitulum there is a fossa known as the radial fossa. Behind and above the trochlea there is another fossa known as the olecranon fossa. In front and above the trochlea there is a fossa known as coronoid fossa.

Medial epicondyle

The medial epicondyle is very prominent and looks medially.

Its anterior portion gives origin to the common tendon of the following muscles :—

- (i) Humeral head of the pronator teres.
- (ii) Flexor carpi radialis.
- (iii) Palmaris longus.
- (iv) Flexor digitorum sublimis.
- (v) Humeral head of the flexor carpi ulnaris

A groove known as the ulnar groove lies behind the medial epicondyle near the trochlea. This groove transmits the ulnar nerve.

The lower part of the medial epicondyle gives attachment to the medial ligament of the elbow joint.

Lateral epicondyle

The lateral epicondyle is not so prominent. Its anterior surface gives origin to the common tendon of the following muscles :—

- (i) Extensor carpi radialis longus.
- (ii) Extensor carpi radialis brevis.
- (iii) Extensor digitorum.
- (iv) Extensor digiti minimi.
- (v) Extensor carpi ulnaris.
- (vi) Supinator.

Its posterior surface gives origin to the anconeus.

Near the capitulum there is a depression which gives attachment to the lateral ligament of the elbow joint.

Capitulum

The capitulum is a rounded eminence which articulates with the cup-shaped depression of the head of the radius.

The radial fossa which is situated above and anterior to the capitulum receives the anterior border of the head of the radius when the forearm is flexed.

Trochlea

The trochlea is just like a pulley. It is concave from side to side but convex from before backwards. It articulates with the olecranon process of the ulna when the forearm is extended. The posterior ligament is attached to the margin.

The coronoid fossa which is situated anterior and above the trochlea, receives the coronoid process of the ulna when the forearm is flexed. The olecranon fossa which is situated behind and above the trochlea articulates with the olecranon process of the ulna when the forearm is extended.

The anterior ligament is attached to the margin.

THE RADIUS

Q. Describe the upper end of the radius.

The radius is a long bone. It is prismoid in shape. It is situated on the lateral side of the forearm. Its upper end is small and forms a small part of the elbow joint.

The upper end consists of a head, a neck and a tuberosity.

The Head

The head of the radius has a shallow cup-shaped depression for articulation with the capitulum of the humerus.

The circumference of the head is smooth. It is broad medially where it articulates with the radial notch of the ulna.

Neck

The neck of the radius is constricted. Below its medial part there is an eminence—the radial tuberosity. Its surface is divided into a dorsal rough portion for the insertion of the tendon of the biceps brachii and a volar smooth portion for a bursa lying between the tendon and the bone.

Q. Describe the body of the radius.

The body or shaft of the radius is prismoid in form. It is narrow above and broad below. It has three borders and three surfaces.

Borders

There are three borders of the radius—anterior or volar, dorsal or posterior and medial or interosseous.

Anterior or Volar border

The anterior or volar border extends from the lower part of the radial tuberosity above to the anterior part of the base of the styloid process below. Its upper part is prominent which has an oblique direction and is known as the oblique line. It gives origin to the flexor digitorum sublimis and flexor pollicis longus. The surface above the line gives insertion to a part of the supinator. The middle part is indistinct. The lower part is prominent and gives insertion to the pronator quadratus and dorsal carpal ligament. It ends in a small tubercle into which the tendon of brachio radialis is inserted. It separates the volar from the lateral surface.

Dorsal or Posterior border

The dorsal or posterior border of the radius extends from the back part of the radial tuberosity above to the dorsal tubercle below. In its upper third this border crosses the shaft of the radius obliquely downwards and laterally. It is known as the posterior oblique line. This line limits the insertion of the supinator above and the origin of the abductor pollicis longus below.

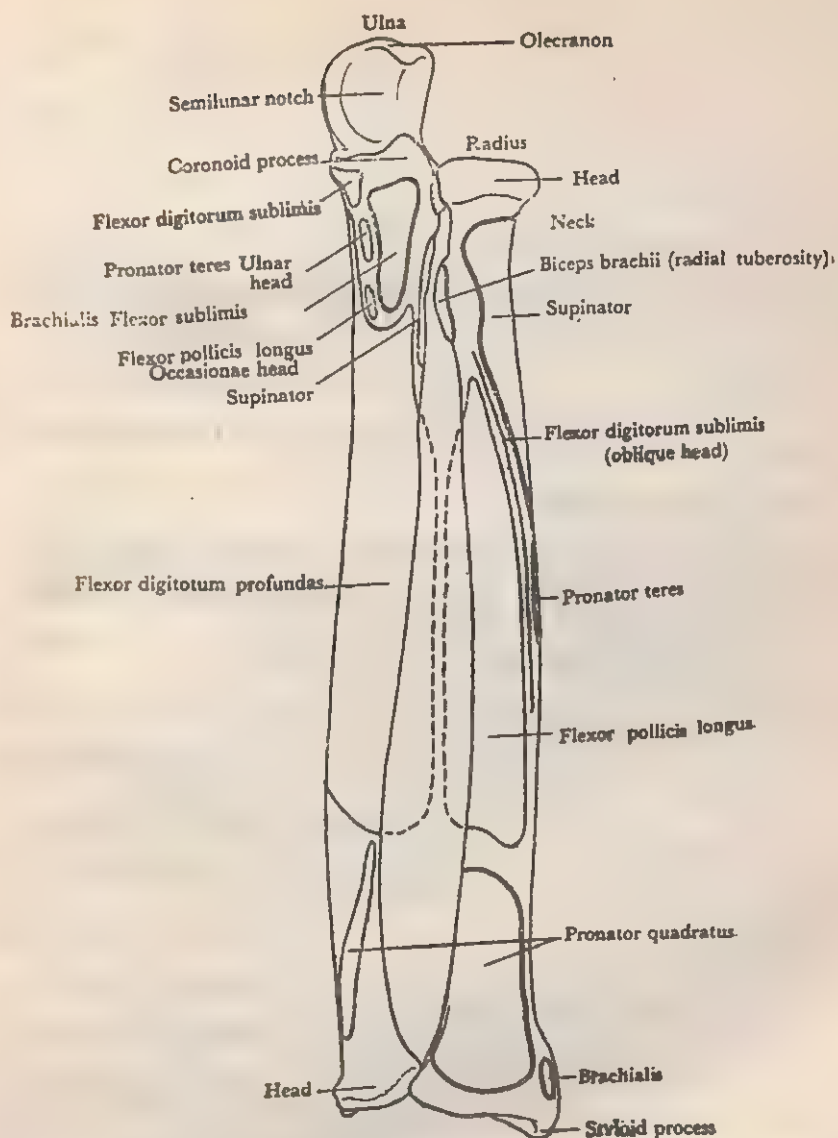


Fig. 12. Volar aspect of the radius and ulna.

It separates the dorsal from the lateral surface.

Medial border or Interosseous crest

The medial border or interosseous crest of the radius extends from the lower and back part of the radial tuberosity and it divides near the lower extremity of the shaft into two ridges—one passing to the anterior margin and the other to the posterior margin of the ulnar notch. It gives attachment to the antibrachial interosseous membrane. The triangular surface between the ridges gives insertion to a part of the pronator quadratus muscle. Its upper part is not prominent but it becomes prominent as it descends. It divides the volar from the dorsal surface.

Surfaces

There are three surfaces of the body of the radius—volar or anterior, dorsal and lateral.

Volar or Anterior surface

The volar or anterior surface of the radius is concave in its upper part. It gives origin to the flexor pollicis longus. Its lower part is broad and flat. It gives insertion to the pronator quadratus. It lies between the anterior and medial borders.

Dorsal surface

The dorsal surface of the radius is convex and smooth in its upper part and gives insertion to a part of the supinator. Its middle part is broad and concave and gives origin to the abductor pollicis longus above and the extensor pollicis brevis below. It lies between the medial and dorsal borders.

Lateral surface

The lateral surface of the body of the radius is convex. Its upper part gives insertion to a part of the supinator. Its lower part is broad and convex. Near its middle portion there is a rough ridge for the insertion of the pronator teres. It lies between the anterior border and the dorsal border.

Q. Describe the lower end of the radius.

The lower end of the radius is broader and larger than the upper end. It has two articular surfaces and three non-articular surfaces.

Articular Surfaces:

There are two articular surfaces e. g. (i) One for the carpus and (ii) the other for the ulna.

1. Carpel articular surface: -

It is triangular, concave, and is divided into two parts by an antero-posterior ridge into a lateral and the medial portions. The lateral portion articulates with the navicular (scaphoid) bone and the medial with the lunate bone.

2. Ulnar articular surface

It articulates with the head of the ulna.

Non-Articular Surfaces

There are three non-articular surfaces, e. g. Volar, Dorsal and Lateral.

The volar surface is rough and gives attachment to the volar radio-carpal ligament.

The dorsal surface is convex and gives attachment to the dorsal radio-carpal ligament and is marked by three grooves. The first groove, from the lateral side is broad and is subdivided by a faint ridge into a lateral portion and a medial portion.

The lateral portion transmits the tendon of the Extensor carpiradialis longus and the medial portion transmits the tendon of the Extensor carpiradialis brevis.

The second groove is deep and transmits the tendon of the Extensor pollicis longus.

The third groove is broad and transmits the tendon of the Extensor Indicis proprius and the Extensor digitorum communis.

The lateral portion of the lower end of the radius is prolonged downwards and is known as the styloid process.

The base gives attachment to the Brachio-radialis and the apex gives attachment to the radio-collateral ligament of the wrist joint. On the lateral surface of the styloid process there is a shallow groove for the tendons of the Abductor pollicis longus and the Extensor pollicis brevis.

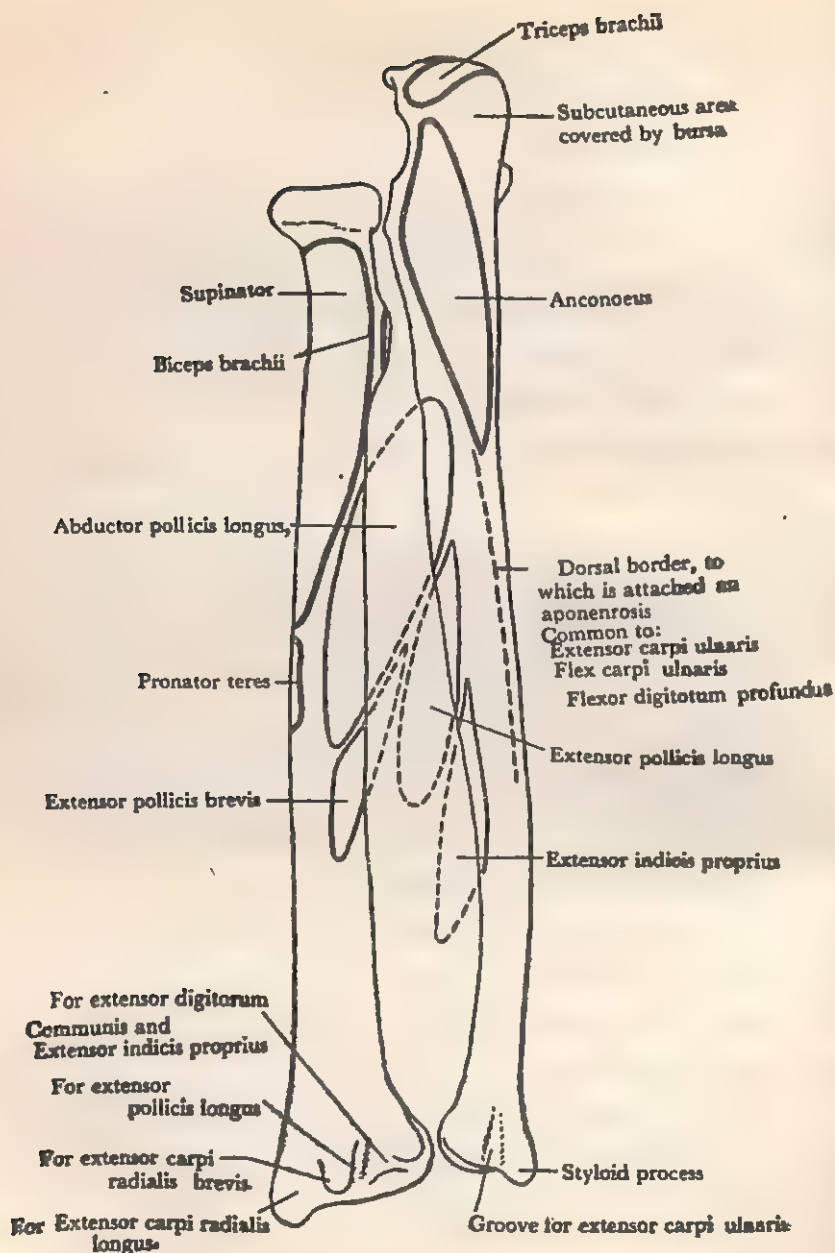


Fig. 13. Dorsal aspect of the radius and ulna.

THE ULNA

Q. Describe the upper end of the ulna.

The upper end of the ulna has two curved processes the olecranon and the coronoids. It has also two concave articular cavities, the semilunar notch or trochlear notch and the radial notch.

Olecranon process—It is a curved process and articulates with the olecranon fossa of the humerus when the forearm is extended. Its dorsal surface is subcutaneous and is covered by a bursa. Its base joins with the body of the ulna.

Its superior surface or upper surface gives insertion to the *Triceps brachii*.

Its volar surface forms the upper part of the semilunar notch.

The medial surface has got a tubercle which gives origin to the ulnar head of the *flexor carpi ulnaris*.

The lateral surface gives insertion to the *anconeus*.

Coronoid Process

The coronoid process is situated in the front of the upper part of the ulna. Its apex is pointed and curved. It articulates with the coronoid fossa of the humerus when the forearm is flexed.

Its base is joined with the body of the ulna.

Its upper surface forms the lower part of the semilunar notch. Its antero-inferior surface is concave and rough. It gives insertion to the *brachialis*.

On the lateral surface of the coronoid process is the radial notch which articulates with the head of the radius.

On the medial surface of the coronoid process there is a rounded eminence which gives origin to the *flexor digitorum sublimis*.

A ridge runs downwards from this rounded eminence which gives origin to the ulnar heads of the *pronator teres* (Deep head).

Semilunar notch or Trochlear notch

The semilunar notch is formed by the anterior surface of the olecranon process and the upper surface of the coronoid process. It is concave and articulates with the trochlea of the humerus.

Radial notch

The radial notch is situated on the lateral surface of the coronoid process. It articulates with the head of the radius.

Q. Describe the body or shaft of the ulna.

The upper three-fourth portion of the body or shaft of the ulna is triangular but its lower one-fourth portion is almost cylindrical. It has three borders anterior, posterior and interosseous crest. It has three surfaces also--anterior, posterior and medial.

Borders**Anterior border**

The anterior border is round and thick. It commences above at the medial sides of the tuberosity of the ulna *i. e.* the medial angle of the coronoid process and ends below to the base of the styloid process. It separates the anterior surface from the medial surface. Its upper part is prominent and its medial part smooth and round. It gives origin to the flexor digitorum profundus. Its lower part forms a ridge which gives origin to the pronator quadratus.

Posterior border

The posterior border begins above at the apex of the triangular area on the dorsal surface of the olecranon and ends below at the back part of the styloid process. Its upper part is well defined and gives common origin to the flexor carpi ulnaris, the extensor carpi ulnaris and the flexor digitorum profundus. Its lower part is smooth and round. It separates the medial surface from the posterior surface.

Interosseous border or Lateral border

The interosseous border begins from the radial notch and ends below at the head of the ulna. It separates the anterior

(volar) surface from the posterior (dorsal) surface and gives attachment to the anti-brachial interosseous membrane. Its upper prominent part is known as the supinator crest. Its lower part is smooth and round.

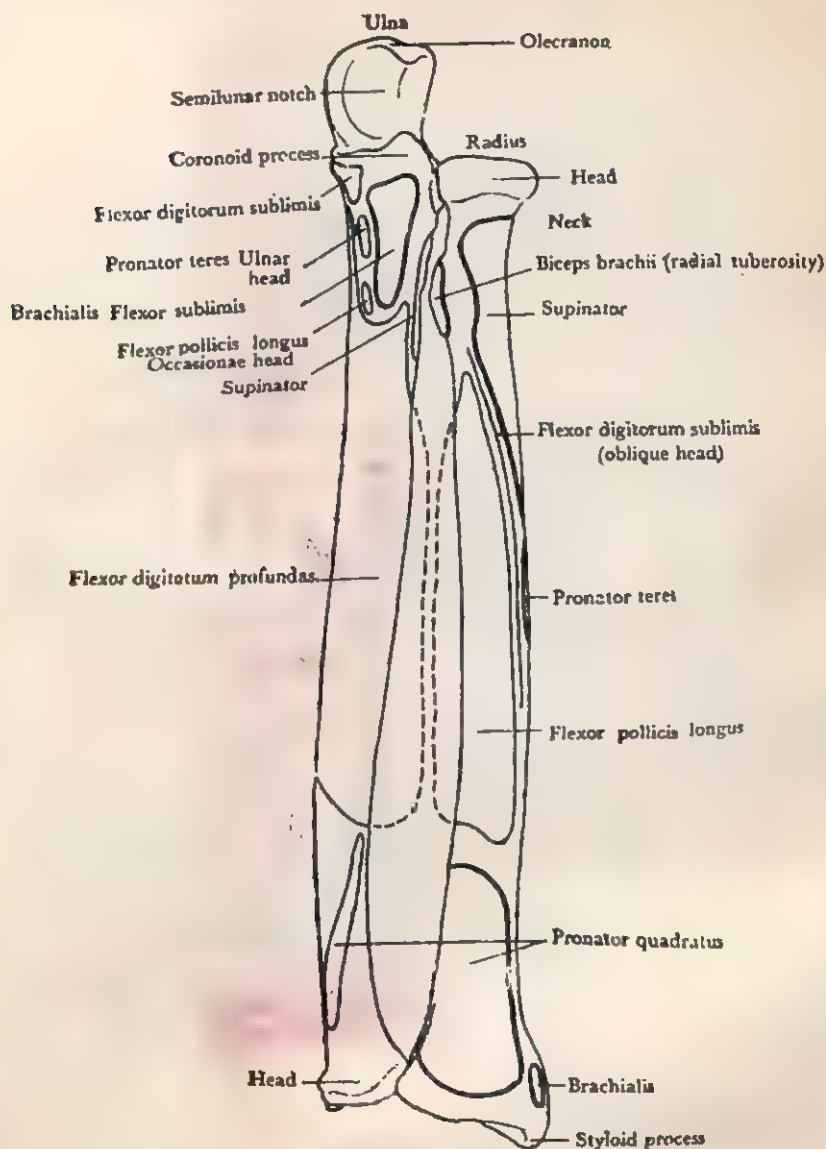


Fig. 14. Volar aspect of the ulna and radius.

Surfaces

Anterior or Volar surface

The anterior or volar surface lies between the interosseous border and the anterior border. Its upper concave portion gives origin to the flexor digitorum profundus and its lower part is covered by pronator quadratus.

Dorsal or Posterior surface

The dorsal or posterior surface has an oblique line on its upper part and runs downwards from the dorsal end of the radial notch to the dorsal (posterior) border.

The upper portion of the oblique line gives attachment to supinator and the anconaeus is inserted on the triangular surface above the line.

Below the oblique line, the dorsal surface is subdivided by a vertical line into medial and lateral portions. The medial portion is covered by the extensor carpi ulnaris, whereas the lateral portion, gives origin from above downwards to the abductor pollicis longus, the extensor pollicis brevis and the extensor indicis proprius. The dorsal surface of the body of the ulna lies between the posterior border and the interosseous crest.

Medial surface

The medial surface lies between the anterior and posterior borders. It is broad and concave above, and narrow and convex below. Its upper part gives origin to the flexor digitorum profundus and its lower part is subcutaneous.

Q. Describe the lower end of the Ulna.

The lower end of the ulna consists of a rounded head and styloid process. It has an articular surface on its lateral side for articulation with the ulnar notch of the radius.

The styloid process is a projected rounded portion which extends from the postero-medial aspect of the lower end of the ulna.

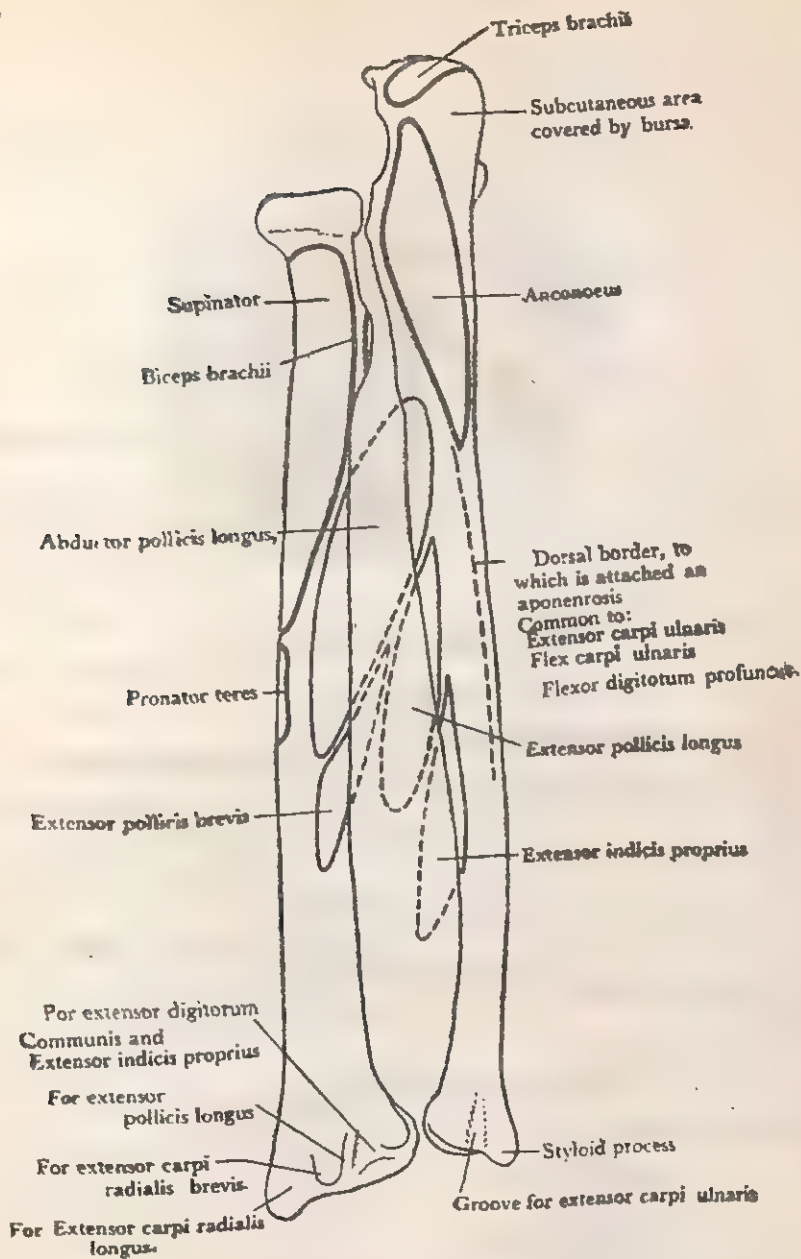


Fig 15. Volar aspect of the ulna and the radius.

BLOOD VESSELS OF THE UPPER EXTREMITY

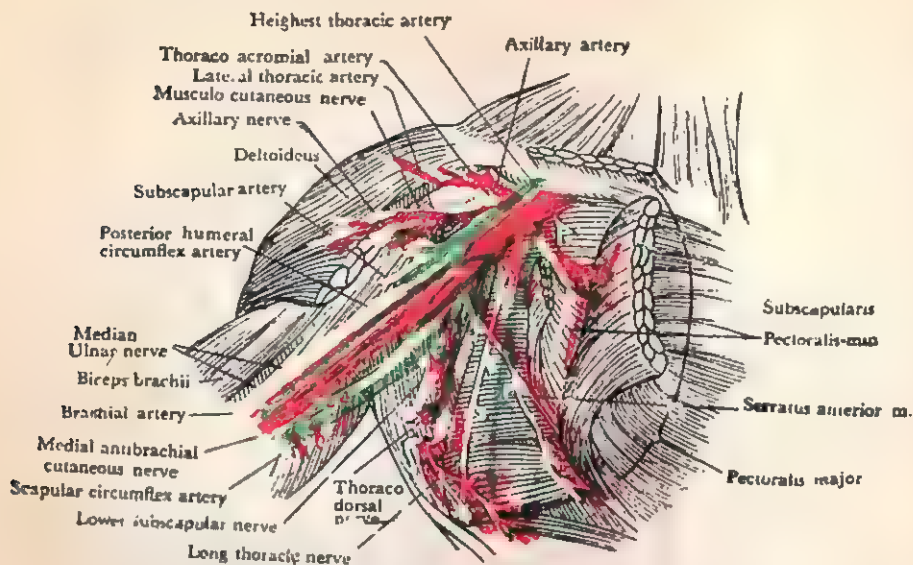


Fig. 16. Axilla showing blood vessels and nerves.

Axillary Artery

Q. Describe the course and relation of the Axillary Artery.

The axillary artery is the continuation of the subclavian artery. It begins at the outer border of the first rib and ends at the lower border of the teres major. It then becomes the brachial artery. Its direction varies the position of the upper limb. The pectoralis minor crosses the artery and divides it into three parts e. g. the first is above the pectoralis minor, the second part lies below the muscle and the third part is distal to the pectoralis minor muscle.

Relation of the first part of the axillary artery:

Anterior relation

- (i) Skin.
- (ii) Superficial fascia.
- (iii) Platysma.
- (iv) Supraclavicular nerves.

- (v) Deep fascia.
- (vi) Clavicular fibres of the Pectoralis major.
- (vii) Lateral pectoral nerve.
- (viii) Cephalic vein.

Posterior relation

1. First intercostal space and external intercostal muscle.
2. First and second digitation of the serratus anterior muscle and its nerve supply.
3. Medial pectoral nerve.
4. Medial cord of the Brachial plexus.

Lateral relation

1. Lateral and posterior cords of the brachial plexus.

Medial relation

1. Axillary vein.

Relation of the second part of the Axillary artery :—

Anterior relation

1. Skin, superficial fascia, deep fascia.
2. Pectoralis major et minor muscles.

Posterior relation

1. Posterior cord of the brachial plexus.

Medial relation

1. Axillary vein.
2. Medial cord of the brachial plexus.
3. Medial pectoral nerve.

Lateral relation

1. Lateral cord of the brachial plexus.
2. Coraco-Brachialis.

Relation of the third part of the Axillary artery :—

Anterior relation

1. Upper part is covered by the Pectoralis major whereas its lower part is superficial and is only covered by the skin and fascie only.

2. Medial root of the median nerve lies anterior to the artery :—

Posterior relation

1. Subscapularis.
2. Tendon of the Latissimus dorsi and Teres major.
3. Radial nerve and Circumflex or Axillary nerve.

Lateral relation

1. Coraco-brachialis.

Medial relation

- (i) Medial cutaneous nerve of the forearm.
- (ii) Axillary vein.
- (iii) Ulnar nerve.
- (iv) Medial cutaneous nerve of the arm.

Q. What are the branches of the Axillary Artery ? Describe briefly.

The following are the branches of the Axillary artery :—

- | | |
|-----------------------------|---------------------------|
| (i) From the first part → | Highest thoracic artery. |
| (ii) From the second part. | (i) Thoraco-acromial. |
| | (ii) Lateral thoracic. |
| (iii) From the third part → | (i) Subscapular. |
| | (ii) Anterior humeral and |
| | (iii) Posterior humeral |
| | Circumflex. |

The highest thoracic artery is a small branch of the first part of the axillary artery. It supplies the upper part of the thoracic wall and anastomoses with the internal mammary and intercostal arteries.

The thoraco-acromial artery arises from the second part of the axillary artery. It divides into four branches after piercing the coraco clavicular fascia.

- | | | | |
|--------|------------|---|--------------------------------------------------------|
| (i) | Pectoral | → | Supplies two pectoral muscles. |
| (ii) | Clavicular | → | Supplies the subclavius muscle. |
| (iii) | Acromial | → | Supplies the deltoid muscle. |
| (iv) | Deltoid | → | Supplies the pectoralis major and the deltoid muscles. |

Lateral thoracic artery

It arises from the second part of the axillary artery. It runs along the lower border of the pectoralis minor to the thoracic wall. It supplies both pectoral muscles and the serratus anterior.

Subscapular artery

It arises from the third part of the axillary artery at the lower border of the subscapularis to the inferior angle of the scapula. It anastomoses with the lateral thoracic and intercostal arteries. It supplies the neighbouring muscles.

Anterior humeral circumflex artery

It arises from the third part of the axillary artery. It runs lateralwards and passes beneath the coraco brachialis and the short head of the biceps brachii. It then runs in front of the surgical neck of the humerus and reaches the bicipital groove. Here it gives off a branch which supplies the shoulder joint. It then crosses the bicipital groove and curves round the surgical neck and anastomoses with the posterior humeral circumflex artery.

Posterior humeral circumflex artery

It arises from the third part of the axillary artery. It runs with the axillary nerve backwards through the quadrilateral space which is formed as follows :—

- | | | |
|-----------|---|--------------------------|
| Above | → | (i) Subscapularis. |
| | | (ii) Teres minor. |
| Below | → | Teres major. |
| Medially | → | Long head of the triceps |
| Laterally | → | Surgical neck. |

The posterior humeral circumflex artery anastomoses with the anterior humeral circumflex artery.

BRACHIAL ARTERY

Q. Describe the course and relation of the brachial artery and also mention its branches.

The brachial artery is the continuation of the axillary artery. It begins at the lower border of the teres major muscle. It runs

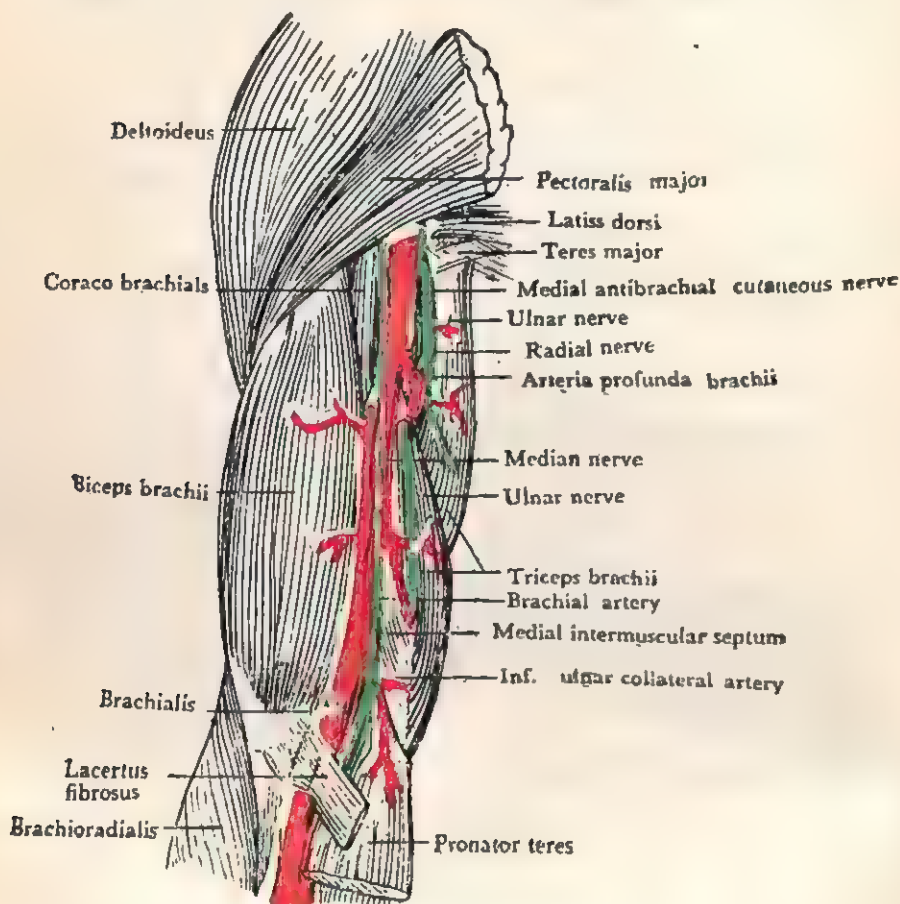


Fig. 17. The brachial artery.

downwards along the arm and ends by dividing into the radial and ulnar arteries 1 c. m. below the elbow joint.

It lies at first on the medial side of the humerus and then it passes in front of the upper portion of the arm. Then it lies at the elbow midway between the humeral epicondyles.

Relations

Anterior relation

The brachial artery lies superficial throughout its whole length and is only covered by the skin, the superficial fascia and the deep fascia. The bicipital aponeurosis is situated in front of the artery opposite the elbow joint. It separates the artery from the median cubital vein. The median nerve crosses the artery from the lateral to the medial side opposite the insertion of the coraco-brachialis.

Posterior-relation

It lies on the longhead of the triceps brachii separating the radial nerve and arteria profunda brachii. It then lies on the medial head of the triceps and the insertion of the coraco-brachialis.

Lateral relation

Above, it is in relation with the median nerve and the coraco-brachialis. Below, it is in relation with the biceps brachii. They sometimes overlap the artery.

Medial relation

The upper half of the artery is in relation with the medial anti-brachial cutaneous and ulnar nerves. The lower half of the artery is in relation with the median nerve. The basilic vein lies on the medial side. The artery is accompanied by two veins.

The following are the branches of the brachial artery:—

- (i) Arteria profunda brachii.
- (ii) Nutrient artery.
- (iii) Ulnar collateral artery.
- (iv) Supratrochlear artery.
- (v) Muscular branches.

Q. Describe the arteria profunda brachii.

The arteria profunda brachii is one of the largest branches of the brachial artery. It arises from the medial side of the

brachial artery, a little below the lower border of the *teres major*. It accompanies the radial nerve. It runs at first backwards between the long head and the medial head of the *triceps brachii*, running in the spiral groove where it is covered by the lateral head of the *triceps brachii*. It then reaches the lateral side of the arm where it divides into anterior and posterior descending branches.

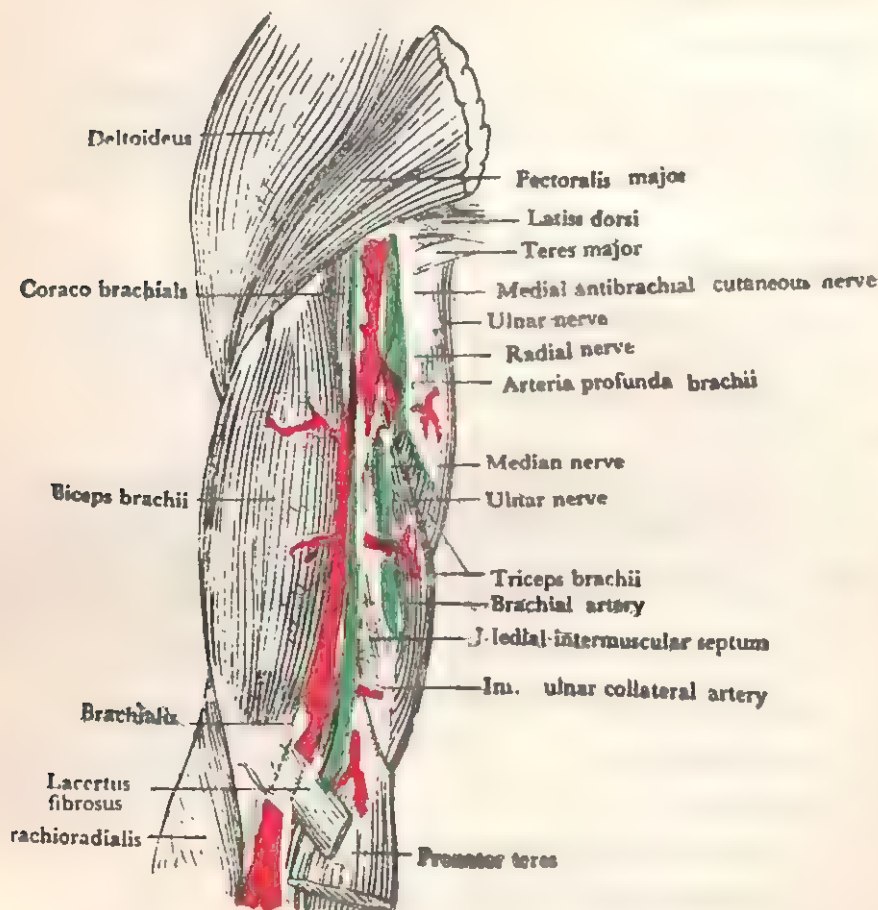


Fig. 18. The *arteria profunda brachii*.

The anterior descending branch which is small, pierces the lateral inter-muscular septum with the radial nerve and runs between the brachio-radialis and the brachialis to the front of the lateral epicondyle of the humerus and anastomoses with the radial recurrent artery.

The posterior descending branch of the arteria profunda brachii descends behind the lateral inter-muscular septum to the back of the lateral epicondyle of the humerus and anastomoses with the supratrochlear and interosseus recurrent arteries.

The following are the branches of the arteria profunda brachii:—

- (i) Branches to the deltoid and three heads of triceps.
- (ii) A branch ascending between the long and lateral heads of the triceps and anastomoses with the posterior circumflex humeral artery.
- (iii) A collateral twig descending in the medial head of the triceps and taking part in anastomosing above the olecranon.

Q. Describe the course and relation of the radial artery. Mention its branches.

The radial artery is one of the terminal branches of the brachial artery. It is smaller than the ulnar artery.

Forearm

It begins 1 cm. below the bend of the elbow at the division of the brachial artery. It runs along the radial side of the forearm to the wrist. It winds backwards, round the lateral side of the carpus.

Wrist

It then passes behind the tendons of the abductor pollicis longus, the extensor pollicis brevis and the extensor pollicis longus to reach the proximal end of the space between the first and second metacarpal bones.

brachial artery, a little below the lower border of the *teres major*. It accompanies the radial nerve. It runs at first backwards between the long head and the medial head of the *triceps brachii*, running in the spiral groove where it is covered by the lateral head of the *triceps brachii*. It then reaches the lateral side of the arm where it divides into anterior and posterior descending branches.

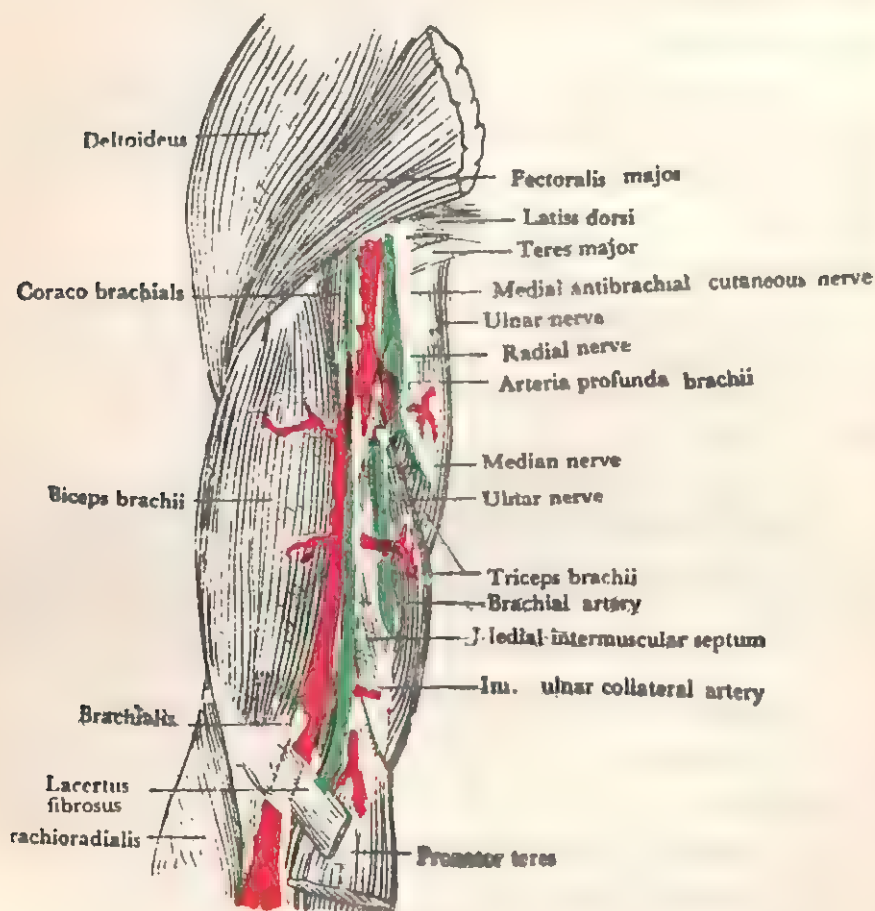


Fig. 18. The *arteria profunda brachii*.

The anterior descending branch which is small, pierces the lateral inter-muscular septum with the radial nerve and runs between the brachio-radialis and the brachialis to the front of the lateral epicondyle of the humerus and anastomoses with the radial recurrent artery.

The posterior descending branch of the arteria profunda brachii descends behind the lateral inter-muscular septum to the back of the lateral epicondyle of the humerus and anastomoses with the supratrochlear and interosseus recurrent arteries.

The following are the branches of the arteria profunda brachii:—

- (i) Branches to the deltoid and three heads of triceps.
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Q. Describe the course and relation of the radial artery. Mention its branches.

The radial artery is one of the terminal branches of the brachial artery. It is smaller than the ulnar artery.

Forearm

It begins 1 cm. below the bend of the elbow at the division of the brachial artery. It runs along the radial side of the forearm to the wrist. It winds backwards, round the lateral side of the carpus.

Wrist

It then passes behind the tendons of the abductor pollicis longus, the extensor pollicis brevis and the extensor pollicis longus to reach the proximal end of the space between the first and second metacarpal bones.

Palm

Here it passes forwards between the two heads of the 1st dorsal interosseus muscle into the palm of the hand. It crosses towards the ulnar side of the palm and forms the deep palmar arch by uniting with the deep branch of the ulnar artery.

The radial artery is, therefore, divisible into three portions, the forearm, the wrist and the hand.

Relations**Forearm**

The radial artery extends from the neck of the radius to the front portion of the styloid process of the radius. It is placed above on the medial side of the shaft of the radius but below it is placed in front of the bone. Its upper portion is covered by the fleshy belly of the brachio-radialis. The rest of the artery is covered by the skin, superficial and deep fasciae. It lies upon the tendon of the biceps, the supinator, the insertion of the pronator teres, the radial origin of the flexor digitorum sublimis, the flexor pollicis longus, the pronator quadratus and the lower end of the radius.

The pronator teres lies on the medial side and the brachio-radialis on the lateral side of the upper one-third of the artery. In the lower two-thirds, the tendon of the brachio-radialis lies on the lateral side and the tendon of the flexor carpi radialis on the medial side of the artery.

The radial nerve (superficial branch) lies to the lateral side of the middle one-third of the vessel. Some filaments of the lateral cutaneous nerve of the forearm pass along the lower portion of the radial artery as it winds round the wrist. The radial artery is accompanied by two veins throughout its whole length.

The portion of the radial artery which lies in front of the lower end of the radius and on the lateral side of the tendon of the flex carpi-ulnaris is used clinically for the observation of the pulse.

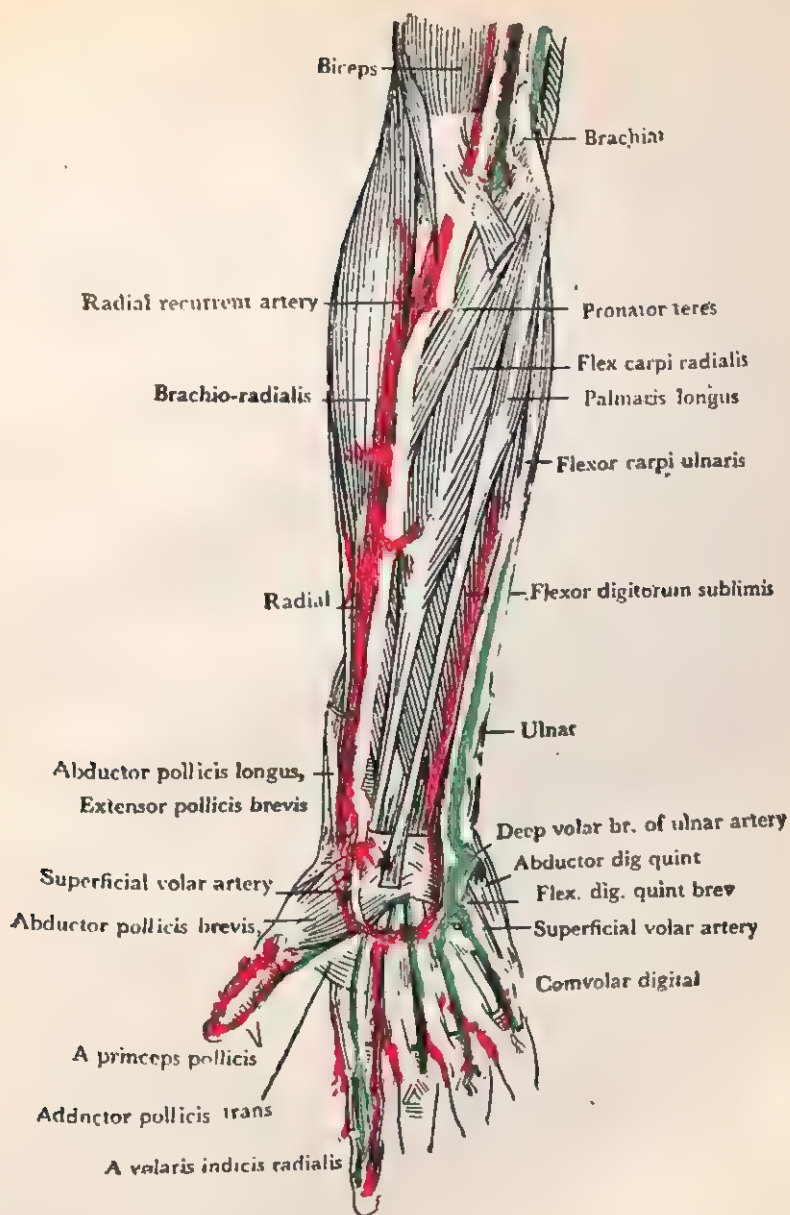


Fig. 19. The radial artery.

Wrist

The radial artery turns the back of the carpus by passing between the lateral ligament of the wrist and the tendons of the abductor pollicis longus and the extensor pollicis brevis. It then runs over the scaphoid and trapezium bones. It is then crossed by the tendon of the extensor pollicis longus before it disappears between the heads of the 1st dorsal interosseous muscle. The cephalic vein and the digital branches of the thumb and the index finger cross the artery in the interval between the extensor pollicis longus and the extensor pollicis brevis.

Hand

The radial artery runs transversely across the palm after emerging from the wrist. It divides into the 1st dorsal interosseous space. Then it runs deep to the oblique head of the adductor pollicis. It then runs between the oblique head of the adductor pollicis and the base of the 1st metacarpal bone, where it anastomoses with the deep branch of the ulnar artery thus completes the deep palmar arch.

Branches

The branches are distributed as indicated below :—

- (i) Radial recurrent artery.
- (ii) Muscular branch.
- (iii) Superficial palmar branch.
- (iv) Posterior carpal branch.
- (v) First dorsal meta-carpal artery.
- (vi) Artery princeps pollicis.
- (vii) Arteria radialis indicis.

Q. Describe the arterial anastomosis around the elbow joint.

The formation of the arterial anastomosis around the elbow joint takes place by the branches of the brachial radial and ulnar arteries. They form a network around the joint.

The profunda brachii artery, a branch of a brachial artery, divides into anterior and posterior branches.

The anterior descending branch passes between the brachioradialis and the brachialis after piercing the lateral inter-muscular septum. It then passes in front of the lateral epicondyle of the humerus and anastomoses with the radial recurrent artery.

The posterior descending branch of the arteria profunda brachii passes behind the lateral epicondyle of the humerus and anastomoses with the interosseous recurrent artery and the supratrochlear artery.

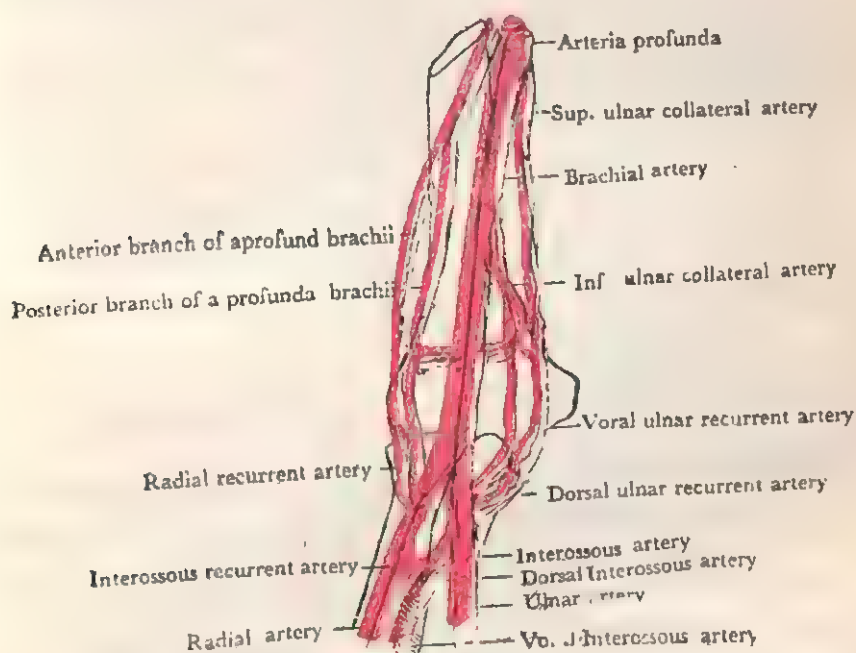


Fig. 20. Arterial Anastomosis around the elbow joint.

The ulnar collateral artery, a branch of the brachial artery, passes between the medial epicondyle of the humerus and the olecranon process of the ulna. It anastomoses with the posterior ulnar recurrent artery and the supratrochlear artery.

The supratrochlear artery arises from the brachial artery.

Wrist

The radial artery turns the back of the carpus by passing between the lateral ligament of the wrist and the tendons of the abductor pollicis longus and the extensor pollicis brevis. It then runs over the scaphoid and trapezium bones. It is then crossed by the tendon of the extensor pollicis longus before it disappears between the heads of the 1st dorsal interosseous muscle. The cephalic vein and the digital branches of the thumb and the index finger cross the artery in the interval between the extensor pollicis longus and the extensor pollicis brevis.

Hand

The radial artery turns transversely across the palm after emerging from the proximal end of the 1st interosseous space between the two heads of the 1st dorsal interosseous muscle. At first, the artery lies deep to the oblique head of the adductor pollicis. Then it runs between the oblique head and the transverse head of the adductor pollicis and at the base of the fifth metacarpal bone, where it anastomoses with the deep branch of the ulnar artery thus completes the deep palmar arch.

Branches

The branches are distributed as indicated below :—

- (i) Radial recurrent artery.
- (ii) Muscular branch.
- (iii) Superficial palmar branch.
- (iv) Posterior carpal branch.
- (v) First dorsal meta-carpal artery.
- (vi) Artery princeps pollicis.
- (vii) Arteria radialis indicis.

Q. Describe the arterial anastomosis around the elbow joint.

The formation of the arterial anastomosis around the elbow joint takes place by the branches of the brachial radial and ulnar arteries. They form a network around the joint.

The profunda brachii artery, a branch of a brachial artery, divides into anterior and posterior branches.

The anterior descending branch passes between the brachioradialis and the brachialis after piercing the lateral inter-muscular septum. It then passes in front of the lateral epicondyle of the humerus and anastomoses with the radial recurrent artery.

The posterior descending branch of the arteria profunda brachii passes behind the lateral epicondyle of the humerus and anastomoses with the interosseous recurrent artery and the supra-trochlear artery.

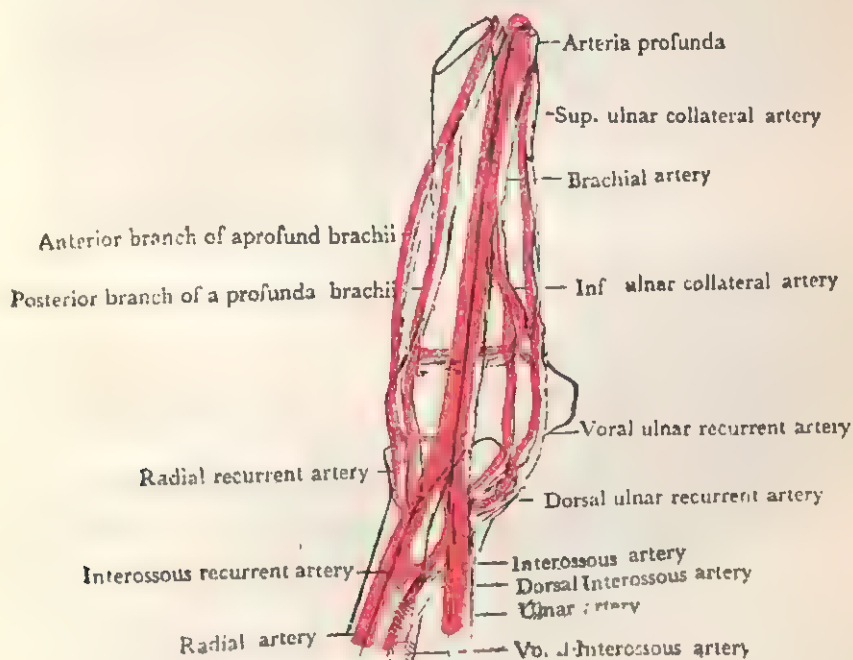


Fig. 20. Arterial Anastomosis around the elbow joint.

The ulnar collateral artery, a branch of the brachial artery, passes between the medial epicondyle of the humerus and the olecranon process of the ulna. It anastomoses with the posterior ulnar recurrent artery and the supratrochlear artery.

The supratrochlear artery arises from the brachial artery.

It passes round the back of the humerus after piercing the medial inter-muscular septum. It then passes between the triceps and the bone and anastomoses with the posterior descending branch of the arteria profunda brachii. A net-work of an arch is thus formed above the olecranon fossa.

From this net-work, the branches arise and supply the bones, the ligaments, the synovial membrane of the elbow joint and the radio-ulnar-joint. These branches also supply the structures around the joint.

Q. Describe the formation of the deep palmar arch.

The deep palmar arch is formed by the anastomosis of the terminal portion of the radial artery with the deep branch of the ulnar artery. It lies upon the proximal portions of the meta-carpal bones and the interossei. The deep palmar arch is covered by the oblique head of the adductor pollicis, the flexor tendons of the fingers and the lumbricles muscles. The deep branch of the ulnar nerve is situated in the concavity of the deep palmar arch.

Branches of the deep palmar arch are as below .—

- (i) Palmar metacarpal arteries.
- (ii) Perforating branches.
- (iii) Recurrent branches.

CUBITAL FOSSA

Q. Describe the boundaries and contents of the cubital fossa.

(Lucknow University, 1964; Agra University, G. H. M.S., 1966)

The cubital fossa is situated at the bend of the elbow. It is triangular in shape. The base is formed by an imaginary line drawn from the two epicondyles. The lateral side is formed by the medial margin of the brachio-radialis and the medial side is formed by the lateral margin of the pronator teres. The floor is formed by the brachialis and the supinator.

Contents:—

1. Biceps Brachii.
2. The terminal part of the brachial artery and its accompanying veins.

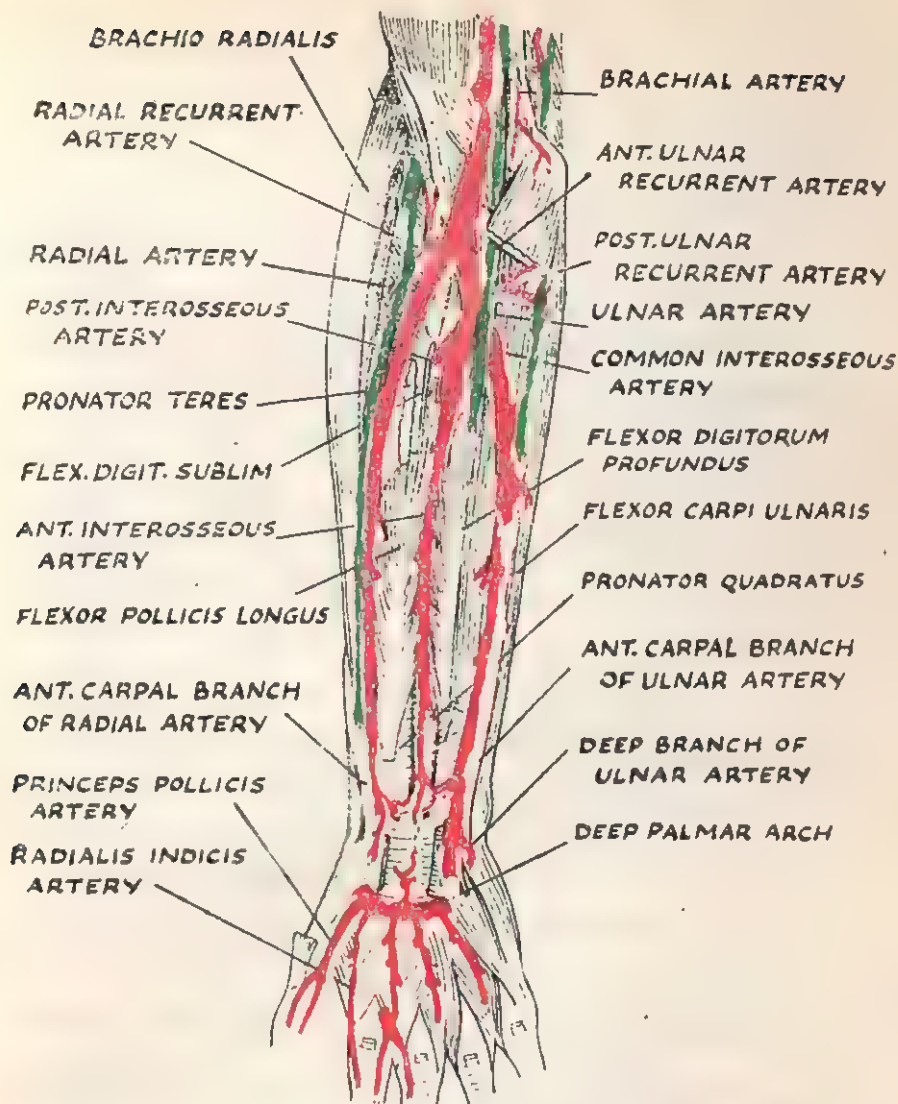


Fig. 21. The right radial and ulnar arteries of the forearm.

3. The origin of the radial and ulnar arteries.
4. Parts of the median and radial nerves.

The brachial artery is situated in the middle of the fossa and divides into the radial and ulnar arteries, opposite the neck of the radius.

Relations

Anterior relation

1. Skin.
2. Superficial fascia.
3. Median cubital vein.
4. Bicipital aponeurosis.

Posterior relation

1. Brachialis.
2. Elbow joint.
3. The median nerve, which is situated on the medial side of the artery above, is separated below from the ulnar artery by the deep head (ulnar head) of the pronator teres.

Lateral relation :--

1. The tendon of the biceps brachii is lateral to the artery. The radial nerve lies upon the supinator and is covered by the brachio-radialis.

Q. Describe the arterial anastomosis around the elbow joint.

The formation of the arterial anastomosis around the joint is as follows :—

The profunda brachii artery divides into the anterior and posterior descending branches.

The anterior descending branch passes between the brachio-radialis and the brachialis after piercing the lateral inter muscular septum. It then passes in front of this lateral epicondyle of the humerus and anastomoses with the radial recurrent artery.

The posterior descending branch passes behind the lateral epicondyle of the humerus and anastomoses with the supra-trochlear and interosseous recurrent arteries.

The ulnar collateral artery, a branch of the brachial artery, passes between the medial epicondyle and the olecranon process

of the ulna and anastomoses with the posterior ulnar recurrent artery and supra-trochlear artery.

The supra-trochlear artery arises from the brachial artery. After piercing the medial intermuscular septum it passes round the back of the humerus between the triceps and the bone and anastomoses with the posterior descending branch of the *arteria profunda brachii*. An arch is thus formed above the olecranon fossa.

Q. Describe the superficial palmar arch and its branches.

The superficial palmar arch is formed by the ulnar artery. The ulnar artery passes in front of the flexor retinaculum and then it passes by the lateral side of the pisiform bone. It then crosses the hook of the hamate bone and enters the palm of the hand. It then crosses the palm forming the convexity towards the fingers and joins with a branch of the *arteria radialis indicis* or a branch of the *arteria princeps pollicis* to form a superficial palmar arch. It is covered by the *palmaris brevis* and the palmar aponeurosis. It lies on the flexor digitorum minimi, the branches of the median nerve, the flexor tendons of the fingers and the lumbricals.

Branches of the superficial palmar arch.

1. Three palmar digital arteries from the convexity of the arch.
2. The palmar digital artery for the medial side of the little finger.

Q. Describe the Deep Palmar arch.

The deep palmar arch is formed by the anastomosis of the terminal part of the radial artery with the deep branch of the ulnar artery. The deep palmar arch is covered by the oblique head of the adductor pollicis, the flexor tendons of the fingers and the lumbrical muscles. The arch is situated near the proximal ends of the metacarpal bones. The deep branch of the ulnar nerve lies in the concavity of the deep palmar arch.

Branches of the deep palmar arch:—

1. Palmar metacarpal arteries.

2. Perforating branches.
3. Recurrent branches.

ULNAR ARTERY

Q. Describe the course, relations and branches of the ulnar artery in the forearm. (*Agra University, G. H. M. S., 1966*)

The ulnar artery is one of the two terminal branches of the brachial artery. It begins at the neck of the radius, 1 cm below the elbow joint. It runs downwards and medialwards deep to the pronator teres and reaches the middle of forearm. It then runs vertically downwards on the medial side of the forearm to the wrist. It then passes over the transverse carpal ligament and the pisiform bone lying on the lateral side of the ulnar nerve. It then gives off a deep volar branch and is continued across the palmar as superficial palmar arch.

Relation in the forearm:—

Anterior relation

1. Pronator teres.
2. Flexor carpi radialis.
3. Palmaris longus.
4. Flexor digitorum sublimis.
5. Flexor carpi ulnaris.

Posterior relation

1. Brachialis.
2. Flexor digitorum profundus.

Medial relation

The median nerve below the elbow.

In the lower half of the forearm, the ulnar artery lies between the flexor carpi ulnaris and the flexor digitorum sublimis. It is covered by the skin, the superficial fascia and the deep fascia.

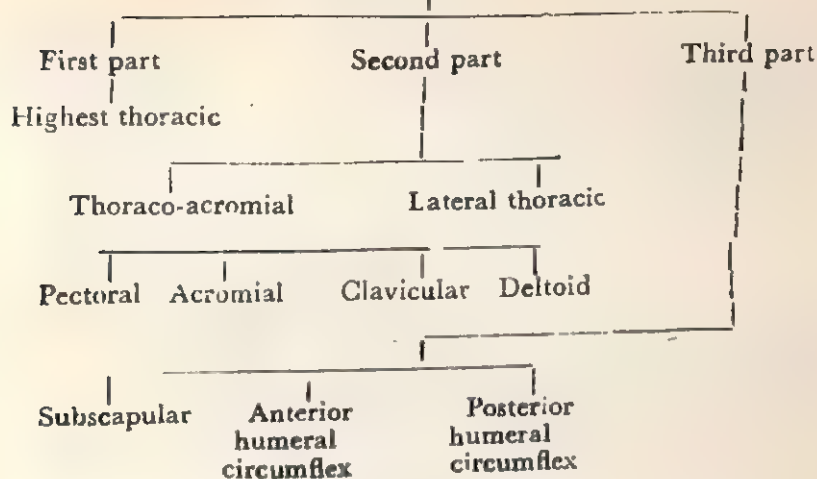
It lies upon the flexor digitorum profundus.

Branches of the ulnar artery in the forearm:—

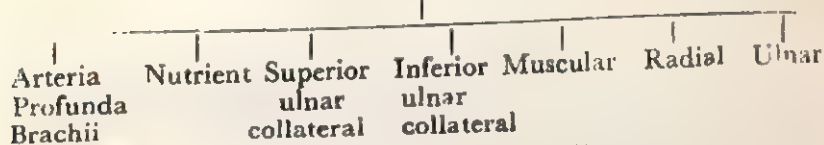
1. Volar recurrent.
2. Dorsal recurrent.
3. Common interosseus.
4. Muscular.

Arteries of the upper Extremity

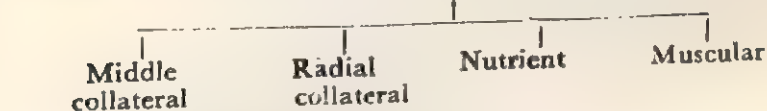
Axillary Artery



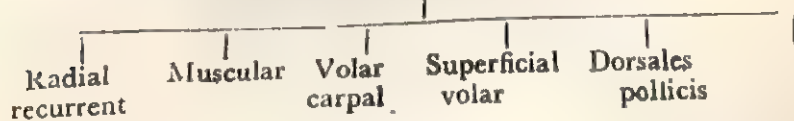
Brachial Artery



Arteria Profunda Brachii



Radial Artery



Dorsales indicis radialis

Dorsal carpal

First dorsal metacarpal

Arteria princeps pollicis

Arteria volaris indicis radialis

Branches in the hand

Superficial palmar arch

Three palmar
digital arteries
from the convexity
of the arch

The palmar
digital artery
for the medial
side of the little
finger

Deep Volar Arch

Volar
metacarpal

Perforating

Recurrent

Articular

Ulnar Artery

Volar
ulnar
recurrent

Dorsal
ulnar
recurrent

Common
interosseous

Muscular

Volar
carpal

Dorsal
carpal

Deep
volar
branch

Superficial
volar arch

Common volar
digital

Q. Describe the boundary of the axilla and its contents.

The axilla is a pyramidal space. It is situated between the upper part of the chest wall and the upper part of the medial side of the upper arm.

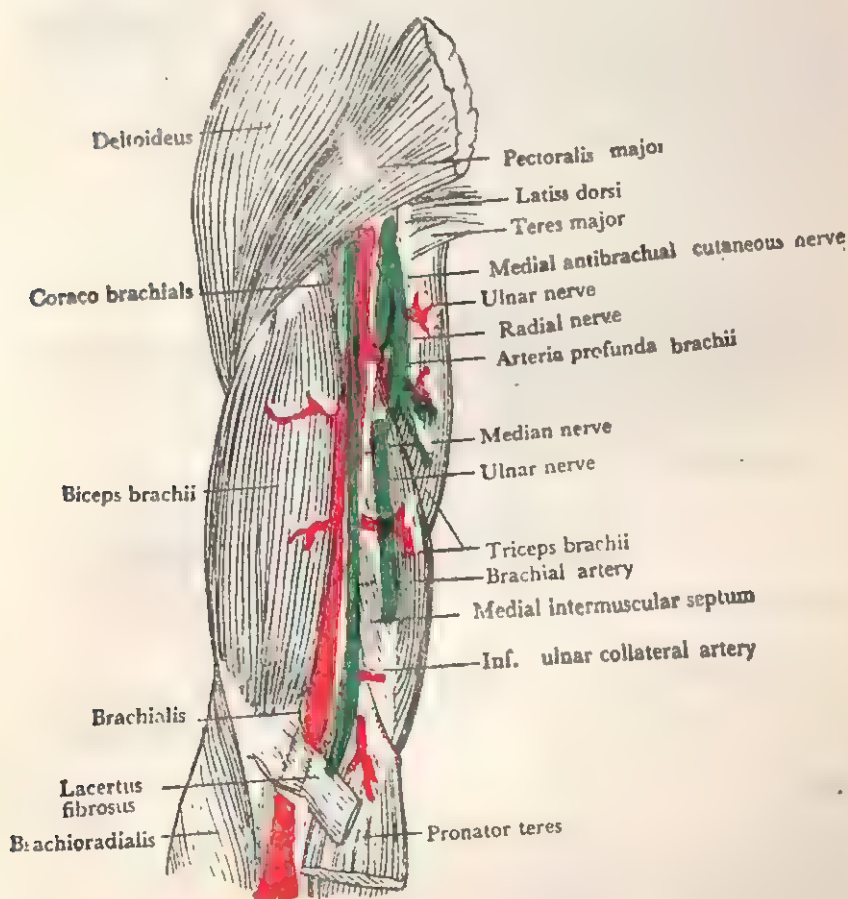


Fig. 22. The Axilla.

It has the apex, the base, the anterior wall, the posterior wall, the medial wall and the lateral wall.

Apex

The apex of the axilla is pointed upwards towards the root of the neck. It corresponds to the interval between the outer border of the 1st rib, the superior border of the scapula and the posterior surface of the clavicle. The axillary vessels and brachial plexus of nerves enter the space from the neck.

Base

The base of the axilla is broad at the chest. It is directed downwards. It is narrow and pointed at the arm. It is formed by the skin and a thick layer of fascia known as the axillary fascia, extending between the lower border of the pectoralis major in front and the lower border of the latissimus dorsi behind.

Anterior Wall

The anterior wall is formed by the pectoralis major and the pectoralis minor.

The pectoralis major muscle covers the whole length of this wall. The pectoralis minor muscle covers only its central part. The space between the upper border of the pectoralis minor and the clavicle is occupied by the clavi-pectoral fascia.

Posterior Wall

The posterior wall is formed by the subscapularis above the teres major and the latissimus dorsi below.

Medial Wall

The medial wall is formed by the first four ribs with their corresponding inter-costal muscles and the upper part of the serratus anterior muscle.

Lateral Wall

The lateral wall is formed by the meeting of the anterior and posterior walls. The space is narrow which is formed by the humerus, the coraco-brachialis and the biceps.

Contents

The contents of the axilla are as follows . . .

- (i) Axillary vessels.
- (ii) Infraclavicular part of the brachial plexus of nerves with its branches.
- (iii) Lateral branches of some of the inter-costal nerves.
- (iv) Large number of lymph glands with a quantity of fat and loose areolar tissue.

The axillary vessels and the brachial plexus of the nerves run from the apex to the base along the lateral wall of the axilla. They are placed nearer to the anterior wall than the posterior wall. The axillary vein lies medial to the axillary artery. The thoracic branches of the axillary artery are in relation with the pectoral muscles. The lateral thoracic artery passes to the side of the thorax along the lower margin of the pectoralis minor.

The subscapular vessels descend along the posterior wall with the lower margin of the subscapularis.

The subscapular nerves and the nerve to the latissimus dorsi cross the anterior surface of the muscle obliquely.

The circumflex scapular vessels wind round the lateral border of the scapula. The posterior humeral circumflex vessels and the circumflex (axillary) nerve curve backwards close to the surgical neck of the humerus.

The nerve to the serratus anterior descends on the surface of the muscle which it supplies.

The inter-costobrachial nerve passes across the axilla to the medial side of the upper arm.

(Mammary Gland)

Q. Describe the mammary glands. What do you know about its blood supply and lymphatic drainage ?

(Lucknow University, 1962)

The mammary glands are present in the male, the female and the children. They are in their rudimentary stage in the male and the children.

In the female, the breasts are large hemispherical eminences in shape. They become enlarged during the period of puberty and lactation and atrophied in old age. They secrete milk in the female.

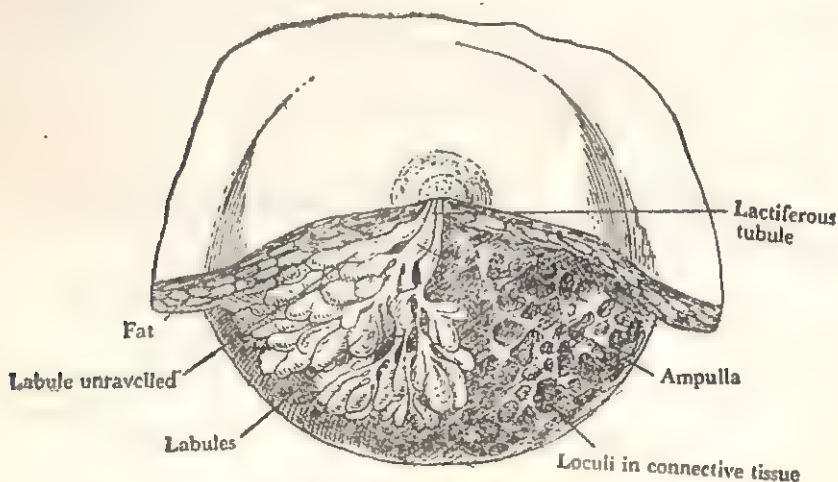


Fig. 23. *Dissection of the lower portion of the breast during the period of lactation.*

Each breast extends vertically from the second rib to the sixth rib and horizontally from the side of the sternum to the

anterior fold of the axilla *i. e.* at the level of the fourth costal cartilage on the mid-clavicular line from the sternum.

It, therefore, lies partly on the side of the chest and partly on the front of the chest. It also lies on the deep fascia covering the pectoralis major and serratus anterior muscles in front and on the sides of the chest. It is separated from the fascia covering the pectoralis major, serratus anterior and the upper part of the obliquus externus abdominis and its apponeurosis by loose areolar tissue.

Nipple

The nipple is situated just below the centre of the breast as a small conical eminence. It is surrounded by areola—a coloured area of the skin. When the breast is not pendulous, the nipple is situated opposite the fourth intercostal space near the cartilages.

The areola has no hair in the female as in the male. Near the base of the nipple and on the surface of the areola, there are many subaceous glands such as areolar glands. There is no fat within the nipple or in the skin of the areola. The normal colour of the skin of the areola is pinkish but it changes from pink to brown in the second month of the first pregnancy and never regains its original colour. The mammary gland is embedded in the superficial fascia.

The gland is made up of 15 to 20 lobes which are again divided into lobules and are held together by strands of fibrous tissue passing through them. Most of the fibrous strands pass from the skin through the superficial fascia and between the lobules to the deep fascia and are known as ligaments of Cooper.

The lactiferous duct of each lobe opens out on the tip of the nipple. Each duct under areola is dilated known as lactiferous sinus. The lactiferous ducts are about 15-20 in number. It has no capsule and no common fascial sheath but the lobes have a fibrous covering and are separated from each other by fibrous strands which pass between them from the skin to the deep fascia. The breast is lying in the superficial fascia. The surface of the

breast in the female is smooth, because the depression are filled with fat which is absent from areola and nipple in both sexes.

Blood supply

The following are the blood vessels supplying the breast :—

- (i) From the lateral thoracic branches of the axillary artery.
- (ii) Perforating branches of the internal mammary artery.
- (iii) Intercostal arteries.

Veins end in the internal mammary and axillary veins and a few ends in the external jugular vein.

Nerve supply

The following are the nerves supplying the breast :—

The nerves are derived from the anterior and lateral cutaneous branches of the 4th, 5th and 6th thoracic nerves.

Lymphatic vessels

The following lymphatic vessels drain the breast :—

- (i) The lateral and central part of the breast including nipple and areola are drained into the pectoral group of the

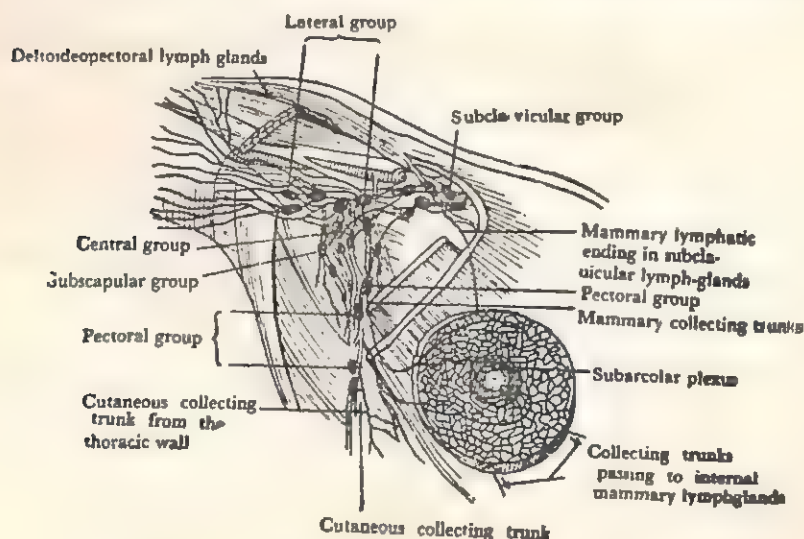


Fig. 24. Lymphatic drainage of the breast.

axillary lymph glands which lie along the lower border of pectoralis major muscle.

(ii) The medial part of the breast is drained into the sternal group of lymph glands known as the internal mammary lymph glands. They lie either at the margin of the sternum along the course of the internal mammary artery or communicates with the lymph vessels of the opposite side of the breast.

(iii) One vessel from the upper part of the breast pierces the pectoralis major and terminates in the apical group of the axillary gland.

(iv) The lower part of the breast is drained into the plexus on the sheath of the upper part of the rectus abdominis muscle between the xiphoid process of the sternum and the seventh costal cartilage.

(v) The lymph vessels of the breast like those of other portions communicate freely with neighbouring lymph vessels.

Infection may be carried from the mammary gland to the other side of the chest or abdomen.

Q. Name the muscles connecting the upper limb with the vertebral column.

The following are the muscles connecting upper limb with the vertebral column :—

- (i) Trapezius.
- (ii) Latissimus dorsi.
- (iii) Rhomboideus major.
- (iv) Rhomboideus minor,
- (v) Levator scapulae.

Q. Describe the origin, insertion, nerve supply and action of following muscles :—

- (i) Trapezius.
- (ii) Rhomboideus minor.

Trapezius

Origin

- (i) From the medial one-third of the superior nuchal line of the occipital bone.
- (ii) From the occipital protuberance.
- (iii) From the ligamentum nuchae.
- (iv) From the spine of the seventh cervical vertebra.
- (v) From the spines of all the thoracic vertebrae.
- (vi) From the supra spinatus ligament.

Insertion

- (i) The superior fibres are inserted into the posterior border of the later one-third of clavicle.

(ii) The middle fibres are inserted into the medial margin of the acromion process and the superior lip of the crest of the spine of the scapula.

(iii) The inferior fibres are inserted into the tubercle at the apex of the triangular surface of the spine of the scapula.

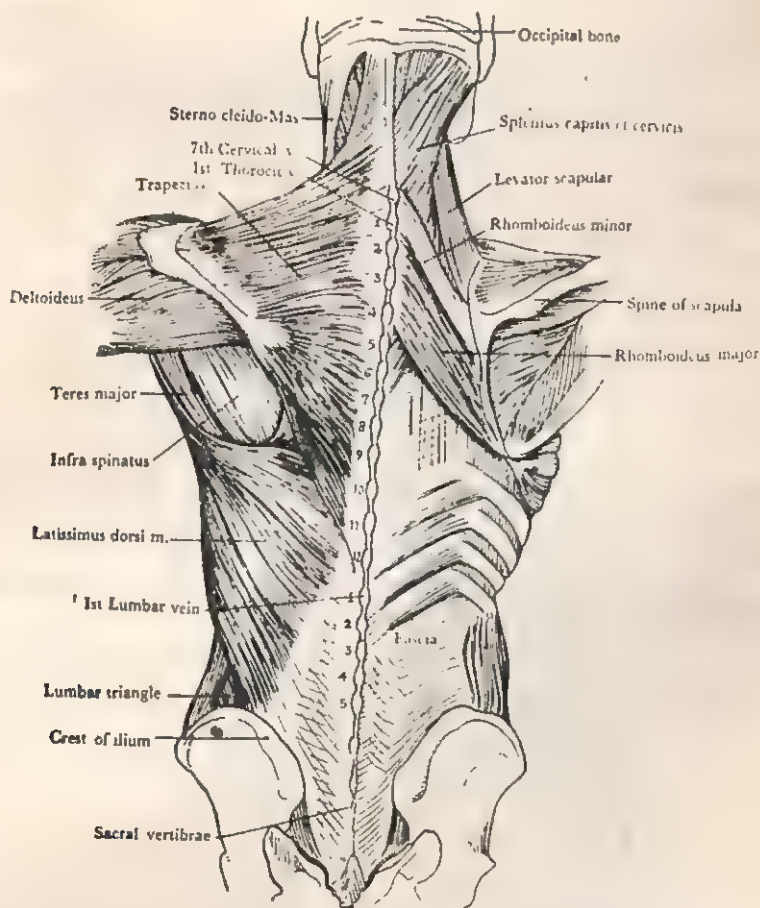


Fig. 25. The muscles of the back connecting the upper limb with the vertebral column.

Nerve supply

It is supplied by the accessory nerve.

Action

It keeps the scapula steady and controls its position and movements during the active use of the upper limb. It also elevates the scapula when it acts with the levator scapulae. It also draws the head backwards and laterally when the shoulder is fixed.

Rhomboideus Minor**Origin**

- (i) From the lower part of the ligamentum nuchae.
- (ii) From the spines of the seventh cervical and first thoracic vertebrae.

Insertion

It is inserted into the base of the triangular smooth surface of the spine of the scapula at its medial end.

Nerve supply

It is supplied by the nerve to rhomboideus.

Actions

The rhomboids and the levator scapulae keep the scapula in position and control the position and movements during active use of the upper limb.

Q. Name the connecting muscles of the upper limb with the anterior and lateral thoracic walls.

The following are the muscles connecting the upper limb with the anterior and lateral thoracic wall:—

- (i) Pectoralis major.
- (ii) Pectoralis minor.
- (iii) Subclavius.
- (iv) Serratus anterior.

Q. Describe the origin, insertion, nerve supply and action of the pectoralis minor and sub-clavius muscles.

Pectoralis minor

It is a thin triangular muscle, situated deep on the pectoralis major and the upper part of the thorax.

Origin

(i) From the upper margins and outer surfaces of the third to fifth ribs near their cartilages.

(ii) From the fasciae covering the external intercostal muscles.

Insertion

It is inserted by a flat tendon into the medial border and upper surface of the coracoid process of the scapula.

Nerve supply

By medial and lateral pectoral nerves.

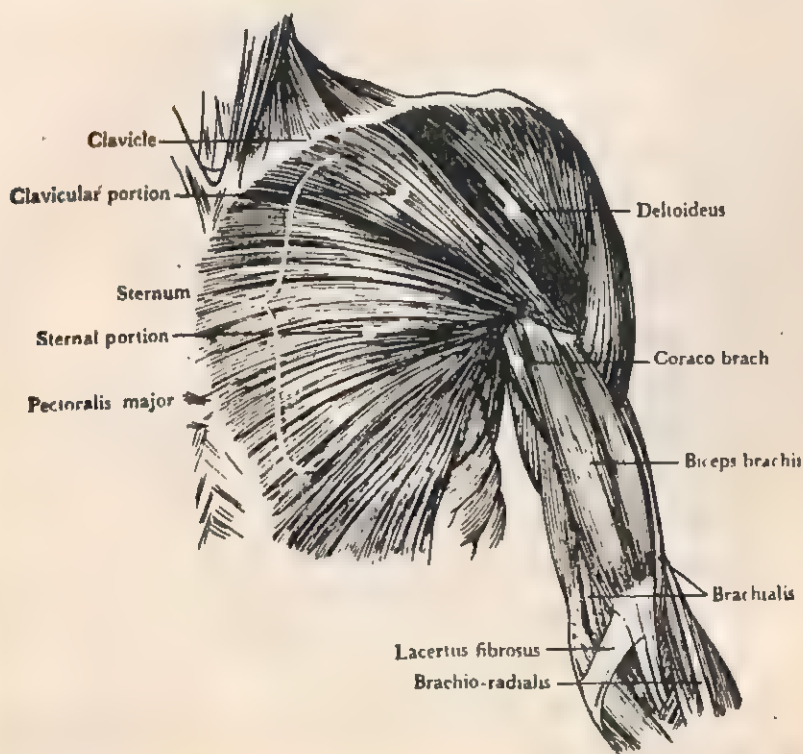


Fig. 26. Superficial muscles of the anterior surface of the chest and the arm,

Actions

It rotates the scapula when it acts with the levator scapulae and the rhomboids so as to depress the point of the shoulder. It also draws the scapula forwards round the chest-wall by assisting the serratus anterior.

Subclavius

It is a small triangular muscle situated between the first rib and the clavicle.

Origin

- (i) From the junction of the first rib and its costal cartilage.
- (ii) From the front costo-clavicular ligament.

Insertion

It is inserted into the postero-inferior surface of the groove of the intermediate third of the clavicle.

Nerve supply

By a branch from the fifth and sixth cervical nerve.

Actions

It pulls the shoulder downwards and forwards and keeps the clavicle steady during the movements of the shoulder.

Q. What are the muscles of the shoulder joint ?

The following are the muscles of the shoulder joint:—

- (i) Deltoideus.
- (ii) Subscapularis.
- (iii) Supraspinatus.
- (iv) Infraspinatus.
- (v) Teres minor.
- (vi) Teres major.

Q. Describe the origin, insertion, nerve supply and action of the following muscles :

- (i) Subscapularis.
- (ii) Supraspinatus.

(iii) Infraspinatus.

(iv) Teres minor.

Subscapularis

It is a triangular muscle situated in the subscapular fossa.

Origin

From the subscapular fossa.

Insertion

It is inserted into the lesser tuberosity of the humerus.

Nerve supply

By the upper and lower subscapular nerves.

Supraspinatus

It occupies the supraspinatus fossa.

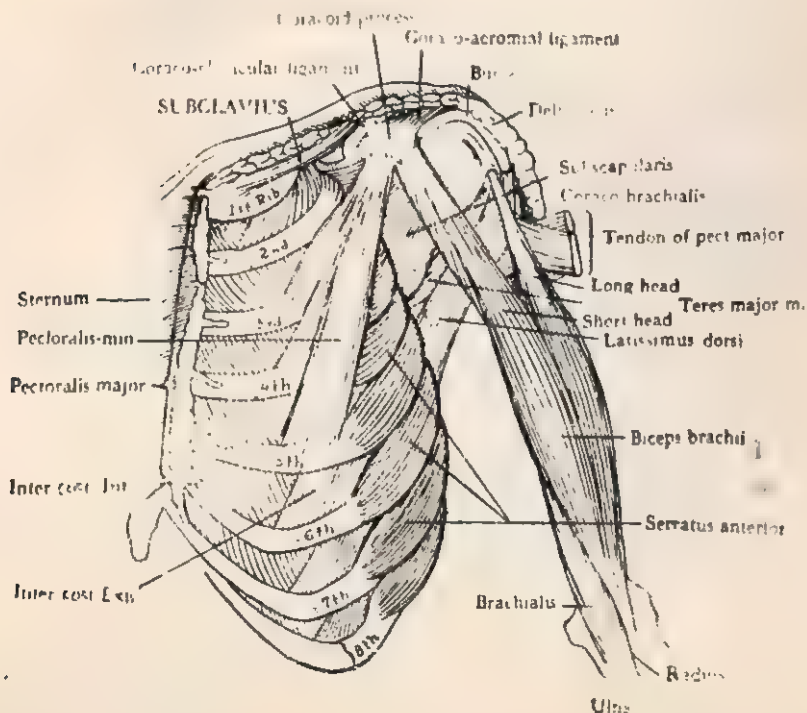


Fig. 27. Deep muscles of the anterior surface of the chest and the arm.

Origin

From the medial two-third of the supraspinatus fossa.

Insertion

It is inserted into the highest of the three impressions on the greater tuberosity of the humerus by a tendon.

Nerve supply

By the suprascapular nerve.

Infraspinatus

It is a thick triangular muscle which fills the infraspinatus fossa.

Origin

From the medial two-third of the infraspinatus fossa,

Insertion

It is inserted by a tendon into the middle impression on the greater tuberosity of the humerus.

Nerve supply

By subcapular nerve.

Teres minor

It is a narrow elongated muscle.

Origin

From the upper two-third of a flattened strip on the lateral part of the dorsal surface adjoining the lateral border.

Insertion

It is inserted into the lowest impression by a tendon on the greater tuberosity of humerus.

Nerve supply

By the circumflex (axillary) nerve.

Actions

All the four muscles—subscapularis, supraspinatus, infraspinatus and teres minor—take part in the movements of the arm and retain their correct relationship to the glenoid cavity. In

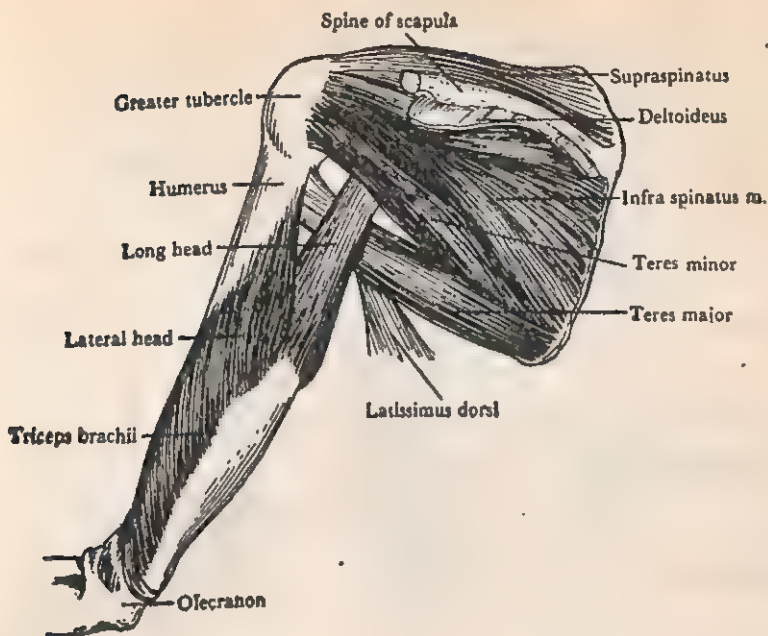


Fig. 28. Muscles of the dorsal surface of the scapula and triceps brachii.

addition, the infraspinatus and the teres minor act as the lateral rotators of the humerus with the posterior fibres of the deltoid. The subscapularis acts as the medial rotator when the arm is by the side.

Muscles of the Upper Arm

Q. What are the muscles of the upper arm ?

The following are the muscles of the upper arm:—

- (i) Coraco-brachialis.
- (ii) Biceps brachii.
- (iii) Brachialis.
- (iv) Triceps brachii.

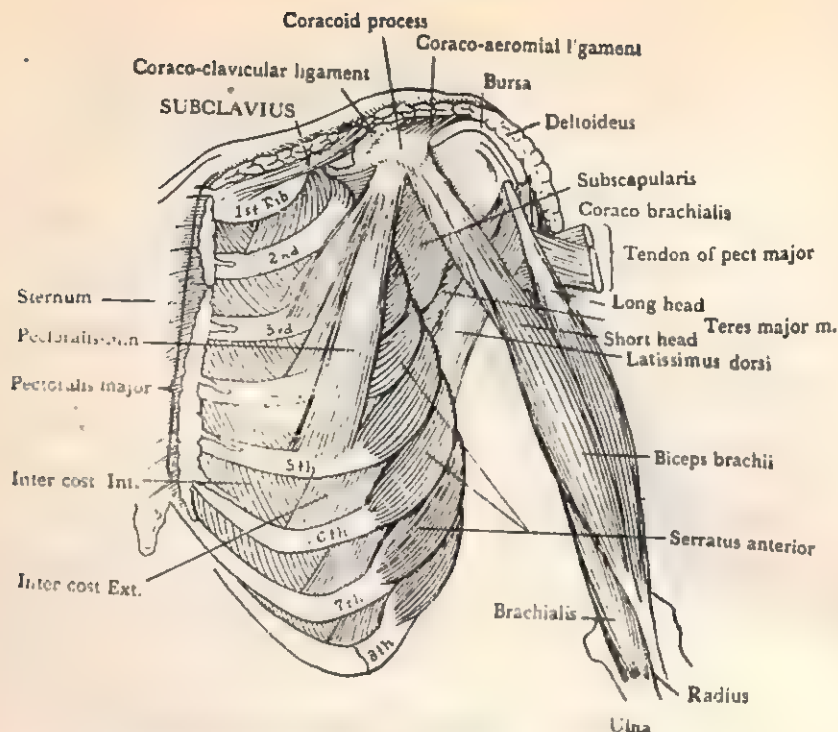


Fig. 29. Muscles of the anterior surface of the arm.

Q. Describe the origin, insertion, nerve supply and actions of Coraco-brachialis and Brachialis.

Coraco-brachialis

The coraco-brachialis muscle is situated at the upper and medial parts of the arm.

Origin

From the apex of the coracoid process of the scapula in common with the tendon of the short head of the biceps.

Insertion

It is inserted into an impression at the middle part of the medial border of the shaft of the humerus.

Nerve supply

By the musculocutaneous nerve.

Actions

It draws the arm forwards and medially.

Brachialis

It is situated in front of the lower half of the humerus and the elbow joint.

Origin

- (i) From the lower half of the front of the humerus.
- (ii) From the inter muscular septum.

Insertion

It is inserted into the tuberosity of the ulna and the rough impression on the antero-inferior surface of the coracoid process by a thick tendon.

Nerve supply

By the musculocutaneous nerve and the radial nerve which supplies its lateral portion.

Actions

It flexes the elbow joint.

Q. Describe the origin, insertion, nerve supply of the following muscles: —

1. Rhomboideus major.
2. Levator scapulae.
3. Latissimus dorsi.

Rhomboideus major:—

Origin—

- (i) From the spines of the 2nd to 5th thoracic vertebrae.
- (ii) From the supra spinous ligament.

Insertion

Into the medial border of the scapula between the root of the spine and the inferior angle of the scapula.

Nerve Supply—Nerve to the rhomboideus.

2. Levator Scapulae

Origin:—

- (i) From the transverse process of the atlas and axis.
- (ii) From the posterior tubercles of the transverse process of the 3rd and 4th cervical vertebrae.

Insertion

Into the medial border of the scapula between the superior angle and the root of the spine of the scapula.

Nerve supply—By the 3rd and 4th cervical nerves and a branch from the Rhomboideus.

3. Latissimus dorsi

Origin:—

- (i) From the spines of the lower six thoracic vertebrae.
- (ii) From the Lumbo dorsal fascia.
- (iii) From the posterior parts of the external lip of the crest of the ilium.
- (iv) From the lower 3 or 4 ribs.

Insertion—

Into the bottom of the bicipital groove of the humerus.

Nerve supply—Nerve to the Latissimus dorsi.

Q. Give origin, insertion, nerve supply, action and relation of Brachialis muscle.

(Agra University, G. H. M. S., 1966)

Brachialis muscle

Origin—

- (i) From the lower half of the antero-medial and antero-lateral surface of the humerus.
- (ii) From the medial and lateral intermuscular septum.

Insertion:—

- (i) Into the tuberosity of the ulna.

(ii) Into the rough depression on the anterior surface of the coronoid process of the Ulna.

Nerve supply—Musculo-cutaneous nerve.

Action—Flexes the elbow joint.

Relation—

Anterior—biceps brachii, brachial vessels, musculo cutaneous nerve and median nerve.

Posterior—Humerus and the capsule of the elbow joint.

Medial—Pronator teres.

Lateral—Radial nerve, radial recurrent artery, brachioradialis and extensor carpi radialis longus.

Q. Describe the origin, insertion, nerve supply and action of the following muscles:—

1. Pectoralis major.
2. Serratus Anterior.
3. Deltoideus.
4. Teres major.
5. Biceps brachii.
6. Triceps brachii.

Pectoralis major

Origin—(i) From the anterior surface of the medial 2/3rd of the clavicle.

(ii) From the anterior surface of the sternum.

(iii) From the cartilages of all the true ribs except 1st and 7th ribs.

Insertion—Into the lateral lip of the bicipital groove of the humerus.

Nerve supply—By the lateral and the medial pectoral nerves of the lateral and the medial cords of the brachial plexus respectively.

Actions—It adducts the arm.

2. Serratus anterior—

Origin— From the anterior surface and superior borders of the 8 or 9 ribs.

Insertion—Into the costal surface of the medial border of the scapula.

Nerve Supply—Nerve to the serratus anterior.

Action—It draws the scapula forwards and helps in pushing and punching movements. It also raises the arm above the head.

3. Deltoideus—

Origin—(i) From the external or upper surface of the lateral 1/3rd of the clavicle.

(ii) From the lateral border and the upper surface of the acromion.

(iii) From the lower lip of the crest of the spine of the scapula.

Insertion—Into the deltoid tuberosity of the body of the humerus.

Nerve supply—By the circumflex (axillary) nerve.

Action—The anterior fibres draw the arm forwards and rotate it medially. The posterior fibres draw the arm backwards and rotate it lateralwards.

4. Teres major—

Origin—(i) From the oval area on the dorsal surface of the inferior angle of the scapula.

(ii) From the fibrous septum between the muscles.

Insertion—Into the medial lip of the bicipital groove or the crest of the lesser tubercle of the humerus.

Nerve Supply—By the lower subscapular nerve.

Action—It draws the arm medially and backwards.

5. Biceps brachii—

It has two heads of origin (i) Long head and (ii) short head.

Long head of biceps brachii

Origin—From the supra glenoid tuberosity of the scapula.

Short head of the biceps brachii

Origin—From the apex of the coracoid process.

Insertion—Both the heads join and are inserted into the posterior part of the radial tuberosity.

Nerve supply—By the musculo-cutaneous nerve.

Action—Supinator of the forearm and flexor of the elbow joint.

6. Triceps brachii

It has got three heads of origin e.g. (i) long head, (ii) lateral head, (iii) medial head.

Long head of triceps brachii

Origin—From the infraglenoid tuberosity of the scapula.

Lateral head of triceps brachii

Origin—(i) From the ridge on the posterior surface of the body of the humerus just above the spiral groove.

(ii) From the lateral border of the humerus.

Medial head of triceps brachii

Origin—(i) From the posterior surface of the body of the humerus just below the spiral groove.

(ii) From the medial border of the humerus.

Insertion—Into the posterior part of the upper surface of the olecranon process of the ulna.

Nerve supply—By the radial nerve.

Action—Extensor of the forearm.

MUSCLES OF THE FOREARM

Q. Name the muscles of the superficial group of the Volar aspect of the forearm. Describe one of them.

The following muscles are the superficial group of the volar aspect of the forearm :—

1. Pronator teres.
2. Flexor carpiradialis.
3. Palmaris longus.
4. Flexor carpi ulnaris
5. Flexor digitorum sublimis.

Pronator teres—It has two heads of origin :

- (i) Humeral head and (ii) ulnar head.

Humeral head

Origin—From the medial epicondyle of the humerus.

Ulnar head.

Origin—From the medial side of the coronoid process of the ulna.

Insertion—Both heads join together to form a tendon which passes obliquely across the forearm from medial to the lateral side and is inserted into the rough surface on the middle portion of the lateral surface of the body of the radius.

Nerve supply—By the median nerve.

Action—Pronates the forearm and hand.

Q. What are the muscles of the Deep group of the Volar aspect of the forearm. Describe one of them.

(Agra University, G. H. M.S., 1966)

The following are the muscles of the deep group of the volar aspect of the forearm—:

1. Flexor digitorum profundus.
2. Flexor pollicis longus.
3. Pronator quadratus.

Pronator quadratus

Origin—(i) From the oblique ridge on the lower part of the anterior surface of the body of the ulna.

(ii) From the anterior surface of the lower $\frac{1}{4}$ th of the ulna.

Insertion

Into the anterior surface of the lower $\frac{1}{4}$ th of the radius.

Nerve supply—

By the anterior interosseous branch of the median nerve.

Action.

Weak action as pronator.

Q. Describe the origin, insertion, nerve supply and action of the following muscles :—

- (i) Flexor carpi radialis.
- (ii) Palmaris longus.
- (iii) Flexor carpi ulnaris.
- (iv) Flexor pollicis longus.

Flexor carpi radialis

It is a muscle of the superficial group of the volar aspect of the forearm and lies on the medial side of the pronator teres.

Origin

(i) From the medial epicondyle of the humerus with the common tendon of the origin of the other superficial group of muscles of the forearm.

(ii) From the anti-brachial fascia.

(iii) From the intramuscular septum.

Insertion

It is inserted into the palmar surface of the base of the 2nd metacarpal bone and sends a twig to the base of the 3rd metacarpal bone.

Nerve supply

By the median nerve.

Action

It flexes the wrist.

Palmaris longus

It is a muscle of the superficial group of the volar aspect of the forearm.

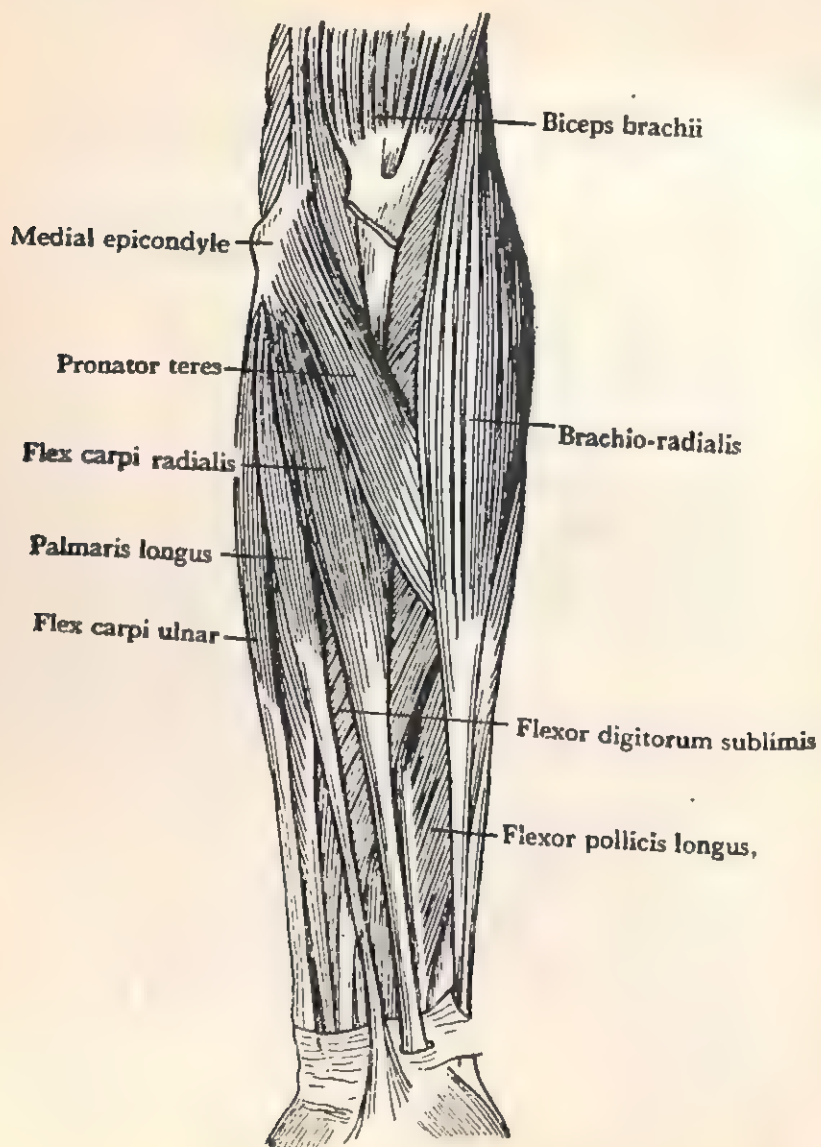


Fig. 30. Superficial groups of the muscles of the volar aspect of the forearm.

It is also a slender muscle, lying on the medial side of the flexor carpi radialis.

Origin

(i) From the medial epicondyle of the humerus with the common tendon of the flexor muscles of the forearm.

(ii) From the inter muscular septum.

(iii) From the antibrachial fascia

Insertion

It ends in a long slender tendon which passes in front of the flexor retinaculum and is inserted into the anterior surface of the distal half of the flexor retinaculum and the central part of the palmar aponeurosis.

Nerve supply

By the median nerve.

Action

It flexes the wrist.

Flexor carpi ulnaris

It is a muscle of the superficial group of the volar aspect of the forearm.

It is situated along the ulnar side of the forearm. It has two heads of origin—humeral and ulnar.

Humeral head

Origin

From the medial epicondyle of the humerus with the common tendon of the forearm.

Ulnar head

Origin

(i) From the medial margin of the olecranon and from the upper two-third of the posterior border of the ulna joined by aponeurosis which is common to the extensor carpi ulnaris and the flexor digitorum Profundus.

From the intermuscular septum.

Insertion

It is inserted into the pisiform bone by a tendon and also to the hamate and the 5th metacarpal bones by the pisohamate and pisometacarpal ligaments.

The ulnar vessels and nerve lie on the lateral side of its tendon of insertion.

Nerve supply

By the ulnar nerve.

Actions

It flexes the wrist. Acting with the extensor carpi ulnaris, it is a powerful adductor of the hand. In addition, it flexes the pisiform bone during adduction of the little finger.

Q. What are the deep group muscles of the volar aspect of the forearm ? Describe two of them.

The following are the deep muscles of the volar aspect of the forearm :

- (i) Flexor digitorum profundus.
- (ii) Flexor pollicis longus.
- (iii) Pronator quadratus.

Flexor digitorum profundus

Origin

(i) From the upper three-fourths of the volar and medial surfaces of the body of the ulna.

(ii) From a depression on the medial side of the coronoid process of the ulna.

(iii) From the upper three-fourths of the dorsal border of the ulna by an aponeurosis, in common with the extensor carpi ulnaris and the flexor carpi ulnaris.

(iv) From the interosseous membrane.

Insertion

The muscle terminates in four tendons which run behind the transverse carpal ligament. They are inserted into the bases of the last phalanges.

Nerve supply

By the ulnar nerve and the volar interosseous branch of the median nerve.

Actions

It flexes the terminal phalanges and the wrist.

Flexor pollicis longus**Origin**

- (i) From the volar surface of the body of the radius.
- (ii) From the interosseous membrane.

Insertion

The muscle ends in a tendon which passes behind the transverse carpal ligament and is inserted into the base of the distal phalanx of the thumb.

Nerve supply

The volar interosseous branch of the median nerve.

Action

It flexes the phalanges of the thumb and the wrist.

Pronator quadratus**Origin**

- (i) From the pronator ridge on the lower portion of the volar surface of the body of the ulna.
- (ii) From the medial portion of the volar surface of the lower one-fourth of the ulna.
- (iii) From the aponeurosis covering the medial one-third of the muscle.

Insertion

- (i) Into the lower one-fourth of the lateral border and the volar surface of the body of the radius.
- (ii) Into the triangular area above the ulnar notch of the radius.

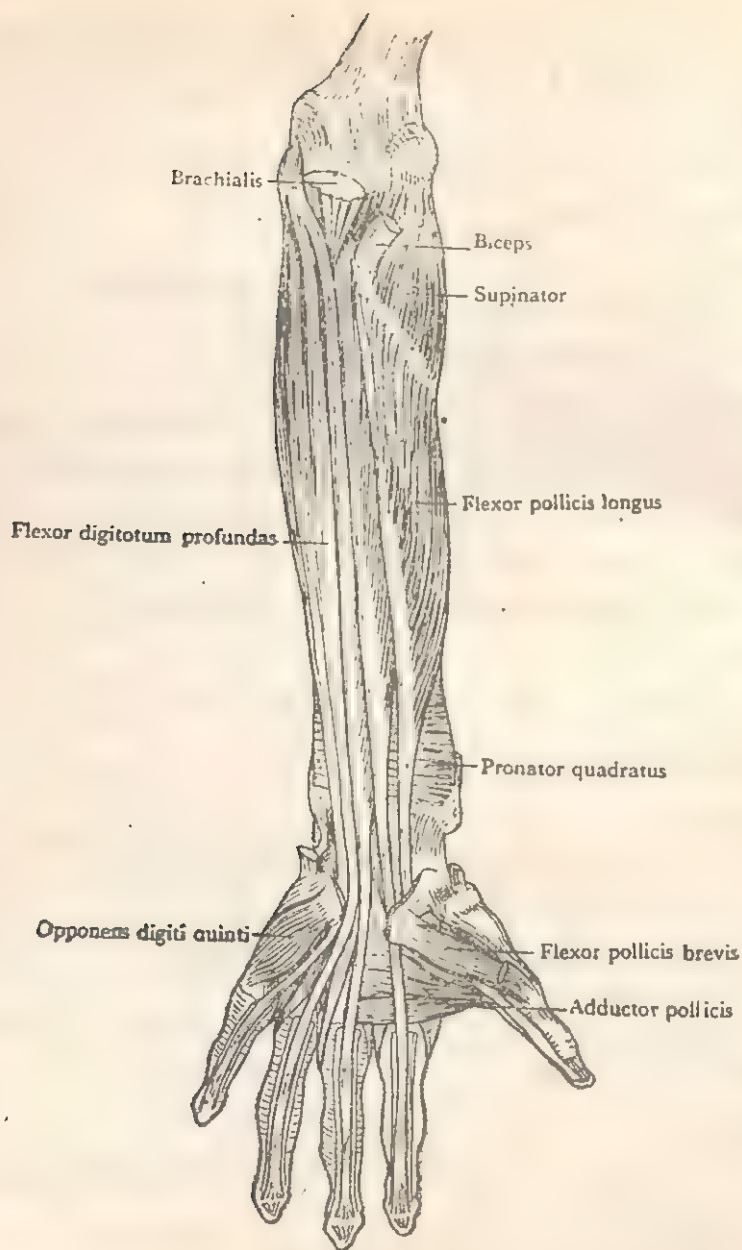


Fig. 31. Deep group muscles of the volar aspect of the forearm.

Nerve supply

The volar interosseous branch of the median nerve.

Action

Pronates the forearm, *i. e.*, turns the palm of the hand backwards.

Q. What are the muscles of the superficial group of the dorsal surface of the forearm?

The following are the superficial group of muscles of the dorsal surface of the forearm:—

- (i) Brachio-radialis.
- (ii) Extensor carpi radialis longus.
- (iii) Extensor carpi radialis brevis.
- (iv) Extensor digitorum communis.
- (v) Extensor digiti quinti proprius.
- (vi) Extensor carpi ulnaris.
- (vii) Anconaeus.

Q. Describe the origin, insertion, nerve supply and action of the following muscles:—

- (i) Extensor carpi radialis longus.
- (ii) Extensor carpi radialis brevis.
- (iii) Extensor carpi ulnaris.
- (iv) Anconaeus.

Extensor carpi radialis longus

It is the muscle of the superficial group of the dorsal surface of the forearm.

It is partly covered by the brachio-radialis muscle.

Origin

- (i) From the lower one-third of the lateral supracondylar ridge of the humerus.
- (ii) From the lateral intermuscular septum.

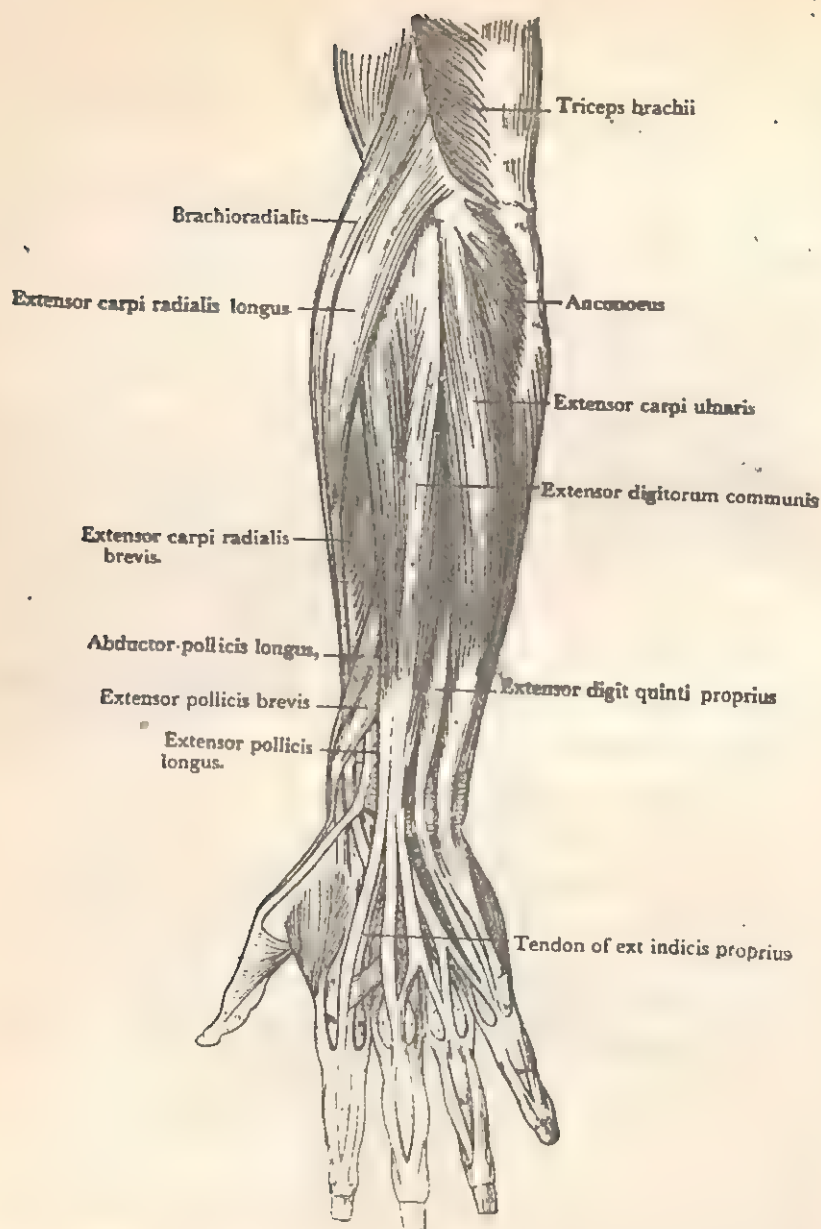


Fig. 32. Superficial group of the dorsal surface of the forearm

Insertion

It is inserted into the radial side of the dorsal surface of the base of the second metacarpal bone.

Nerve supply

By the radial nerve.

Action

It extends the wrist.

Extensor carpi radialis brevis

It is a muscle of the superficial group of the dorsal surface of the forearm. It is a shorter muscle than the extensor carpi radialis longus which covers it.

Origin

- (i) From the lateral epicondyle of the humerus by a common tendon of the extensor muscles of the superficial group.
- (ii) From the intermuscular septum.

Insertion

It is inserted into the dorsal surface of the base of the third metacarpal bone and also second metacarpal bone.

Nerve supply

By the posterior interosseous nerve.

Actions

It extends the wrist.

Extensor carpi ulnaris

It is also a muscle of the superficial group of the dorsal surface of the forearm.

Origin

- (i) From the lateral epicondyle of the humerus by a common tendon of the extensor muscles of the superficial group of the forearm.
- (ii) From the posterior border of the ulna by an aponeurosis in common with the flexor carpi ulnaris and the flexor digitorum profundus.

Insertion

It is inserted into the tubercle on the ulnar side of the base of the fifth metacarpal bone.

Nerve supply

By the posterior interosseous nerve.

Actions

It extends the wrist. Acting with flexor carpi ulnaris it adducts the hand.

Anconaeus

It is a muscle of the superficial group of the dorsal surface of the forearm. It is a small triangular muscle on the back of the elbow joint.

Origin

From the posterior surface of the lateral epicondyle of the humerus.

Insertions

It is inserted into the lateral side of the olecranon and the upper one-fourth of the posterior surface of the shaft of the ulna.

Nerve supply

By the radial nerve.

Actions

It extends the elbow joint and also helps in pronation.

Q. What are the muscles of the deep group of the dorsal surface of the forearm ?

The following are the muscles of the deep group of the dorsal aspect of the forearm :—

- (i) Supinator.
- (ii) Abductor pollicis longus.
- (iii) Extensor pollicis brevis.
- (iv) Extensor pollicis longus.
- (v) Extensor indicis.

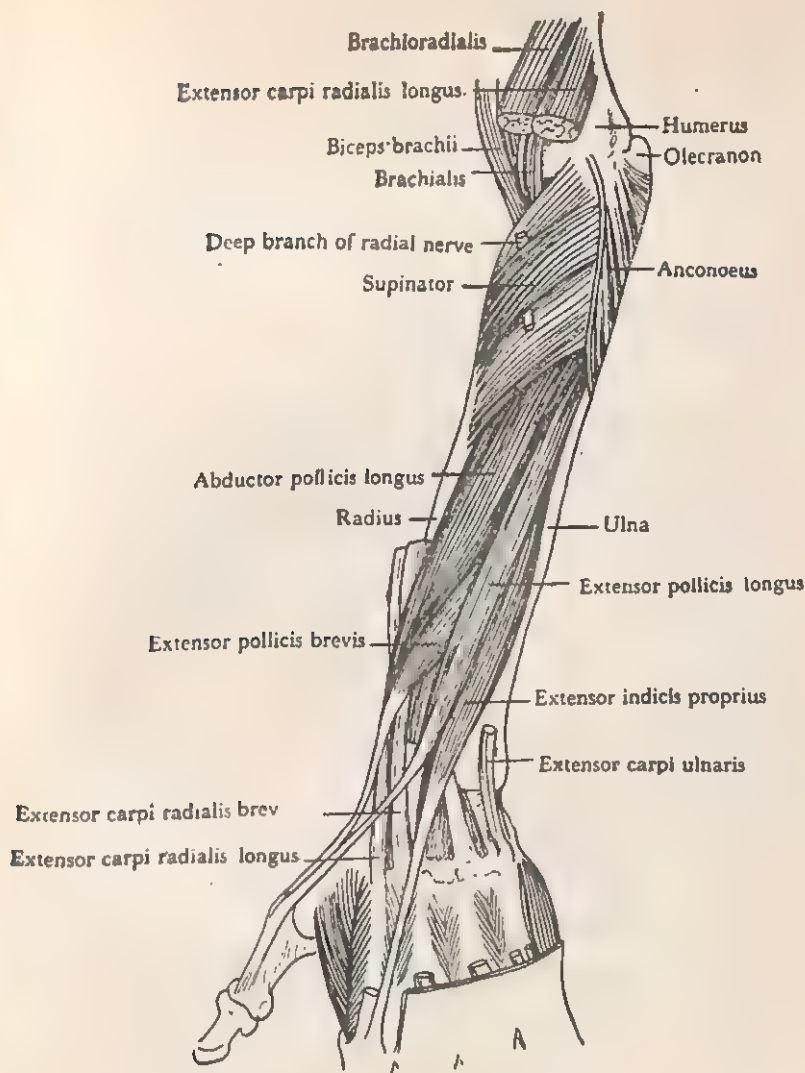


Fig. 33. Deep groups of muscles of the dorsal surface of the forearm.

Q. Describe the origin, insertion, nerve supply and action of the following muscles:—

- (i) Supinator.
- (ii) Abductor pollicis longus.

(iii) **Extensor pollicis longus.**

(iv) **Extensor indicis.**

Supinator

It is a muscle of the deep group of the dorsal surface of the forearm. It surrounds the upper one-third of the radius and consists of the superficial and deep parts between which the posterior interosseous nerve passes.

The two parts arise in common.

Origin

(i) From the lateral epicondyle of the humerus.

(ii) From the supinator crest of the ulna.

(iii) From the lateral ligament of the elbow joint.

Insertion

It is inserted into the lateral surface of the proximal one-third of the radius.

Nerve supply

By the posterior interosseous nerve.

Actions

It rotates the radius so as to turn the palm of the hand forwards. It supinates the hand.

Abductor pollicis longus

It is a muscle of the deep group of the dorsal surface of the forearm.

Origin

(i) From the lateral part of the posterior surface of the shaft of the ulna.

(ii) From the interosseous membrane.

(iii) From the middle one-third of the posterior surface of the shaft of the radius.

Insertion

It is inserted into the medial side of the base of the 1st metacarpal bone and also gives off two slips—the one is attached to the trapezium and the other is blended with the origin of the abductor pollicis brevis.

Nerve supply

By the posterior interosseous nerve.

Actions

It abducts the thumb. Acting with the extensor pollicis, it extends the thumb of the carpometacarpal joint.

Extensor pollicis longus

It is also a muscle of the deep group of the dorsal surface of the forearm.

Origin

(i) From the lateral part of the middle one-third of the posterior surface of the shaft of the ulna.

(ii) From the interosseous membrane.

Insertion

It is inserted into the base of the distal phalanx of the thumb.

Nerve supply

By the posterior interosseous nerve.

Actions

It extends the distal phalanx of the thumb. Acting with the extensor pollicis brevis and abductor pollicis longus, it extends the proximal phalanx and the metacarpal bone.

Extensor Indicis

It is a muscle of the deep group of the dorsal surface of the forearm.

Origin

(i) From the posterior surface of the shaft of the ulna.

(ii) From the interosseous membrane.

Insertions

It is inserted into the terminal phalanx of the index finger.

Nerve supply

By the posterior interosseous nerve.

Actions

It helps to extend the index finger and the wrist.

MUSCLES OF THE HAND

Q. Describe the origin, insertion, nerve supply and action of the muscles of the thenar eminence or lateral muscles of the palm.

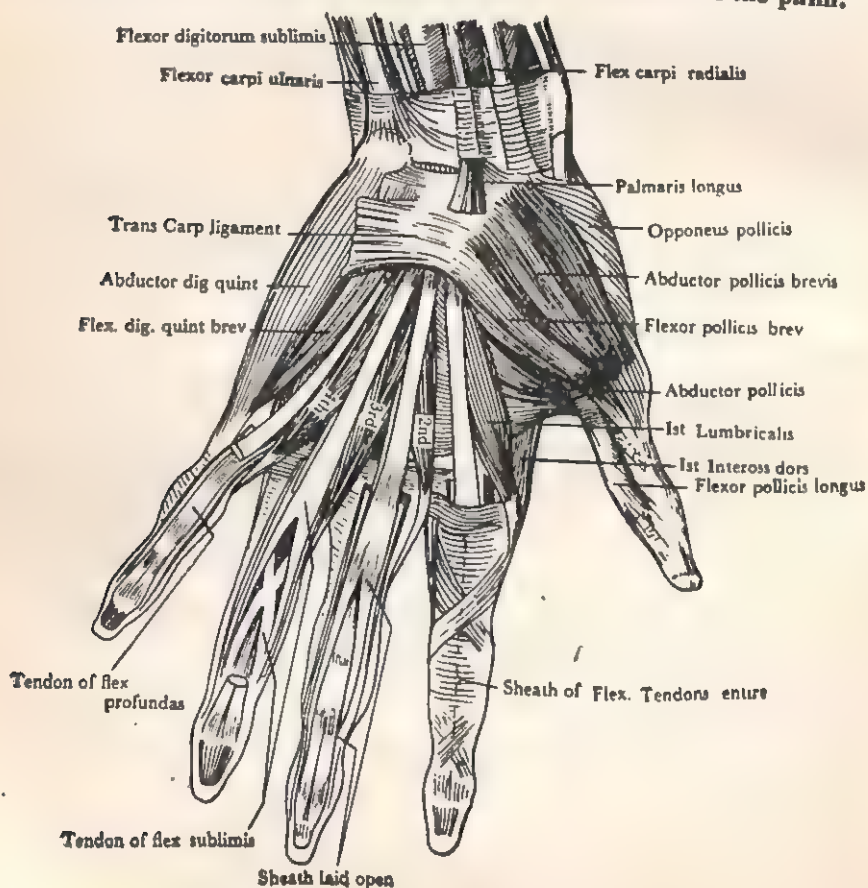


Fig. 34. Muscles of the hand (volar aspect).

The following are the muscles of the thenar eminence:—

- (i) Abductor pollicis brevis.
- (ii) Opponens pollicis.
- (iii) Flexor pollicis brevis.
- (iv) Abductor pollicis.

Abductor pollicis brevis

It is a thin muscle which occupies the radial side of the thenar eminence.

Origin

- (i) From the flexor retinaculum.
- (ii) From the tubercle of the scaphoid bone.
- (iii) From the crest of the trapezium.
- (iv) From the tendon of the abductor pollicis longus.

Insertion

Its medial fibres are inserted into the radial side of the base of the proximal phalanx of the thumb. Its lateral fibres join the dorsal digital expansion of the thumb.

Nerve supply

By the lateral terminal branch of the median nerve.

Actions

It draws the thumb forwards and rotates it medially.

Opponens pollicis

It is placed under the cover of the abductor pollicis brevis.

Origin

- (i) From the crest on the trapezium.
- (ii) From the flexor retinaculum.

Insertion

It is inserted into the whole length of the lateral border and the lateral half of the palmar surface of the metacarpal bone of the thumb.

Nerve supply

By the lateral terminal branch of the median nerve.

Actions

It flexes the metacarpal bone of the thumb and bends medially across the palm of the hand and rotates it medially.

Flexor pollicis brevis

It lies on the ulnar side of the abductor pollicis brevis.

Origin

- (i) From the lower border of the flexor retinaculum.
- (ii) From the lower part of the crest of the trapezium.

Insertion

It is inserted into the radial side of the base of the proximal phalanx of the thumb.

Nerve supply

It receives a double nerve supply, one from the lateral terminal branch of the median nerve and the other from the deep branch of the ulnar nerve.

Actions

It flexes the proximal phalanx of the thumb and the metacarpal bone and rotates them medially.

Abductor Pollicis

It arises by two heads—an oblique head and a transverse head.

Oblique head**Origin**

- (i) From the capitate and trapezoid bones.
- (ii) From the bases of the second and third metacarpal bones.
- (iii) From the palmar ligaments of the carpus.

Transverse head**Origin**

From the distal two third of the palmar surface of the third metacarpal bone,

Insertion

The fibres are inserted into the ulnar side of the base of the proximal phalanx of the thumb.

Nerve supply

By the deep branch of the ulnar nerve.

Actions

It approximates the thumb of the palm of the hand.

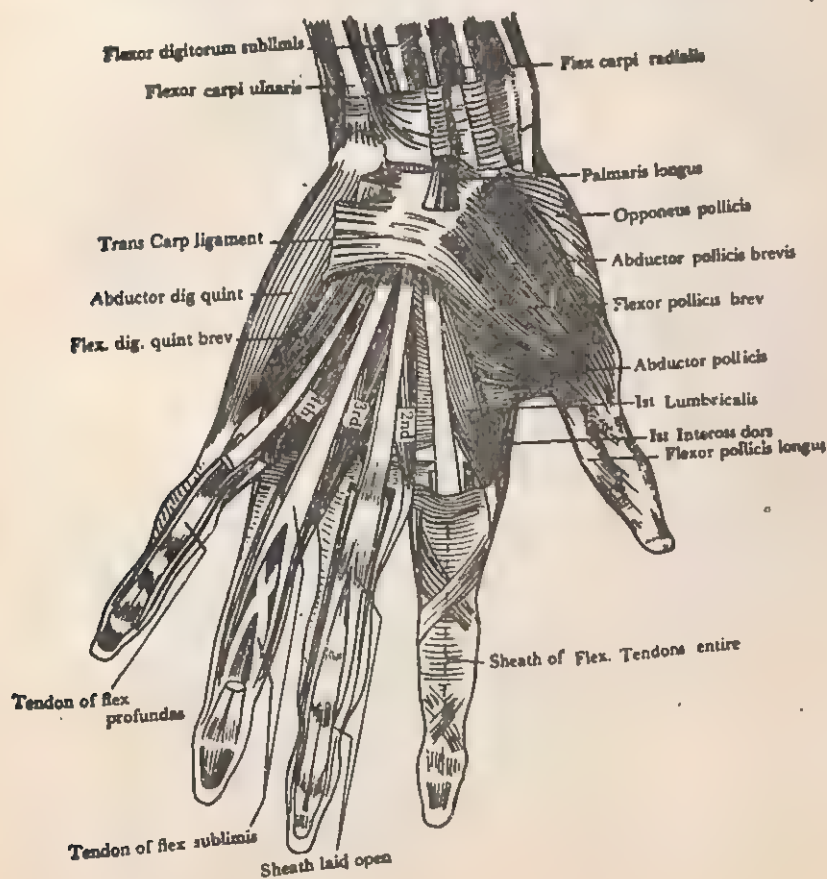


Fig. 35. Muscles of the hand showing lumbricales.

Q. Describe the origin, insertion, nerve supply and action of the muscles of the hypothenar eminence (Medial muscles of the palm).

The following are the muscles of the hypothenar eminence :—

- (i) *Palmaris brevis*.
- (ii) *Abductor digiti minimi*.
- (iii) *Flexor digiti minimi*.
- (iv) *Opponens digiti minimi*.

Palmaris brevis

It is a thin quadrilateral muscle, placed beneath the skin of the ulnar side of the hand.

Origin

- (i) From the flexor retinaculum.
- (ii) From the medial border of the central part of the palmar aponeurosis.

Insertion

It is inserted into the skin on the ulnar border of the hand.

Nerve supply

By the superficial branch of the ulna nerve.

Action

It wrinkles the skin on the ulnar side of the palm of the hand and deepens the hollow of the palm.

Abductor digiti minimi

It is situated on the ulnar border of the palm of the hand.

Origin

- (i) From the pisiform bone.
- (ii) From the tendon of the flexor carpi ulnaris.
- (iii) From the pisio-hamate ligament.

Insertion

Its tendon divides into two slips—one is inserted into the ulnar side of the base of the proximal phalanx of the little finger and the other is inserted into the ulnar border of the dorsal digital expansion of the extensor digiti minimi.

Nerve supply

By the deep branch of the ulnar nerve.

Action

It abducts the proximal phalanx of the little finger.

Flexor Digiti Minimi

It lies on the radial side of the abductor digiti minimi.

Origin

- (i) From the convex surface of the hook of the hamate bone.
- (ii) From the palmar surface of the flexor retinaculum.

Insertion

It is inserted into the ulnar side of the base of the proximal phalanx of the little finger.

Nerve supply

By the deep branch of the ulnar nerve.

Action

It flexes the proximal phalanx of the little finger.

Opponens digiti minimi

It is a triangular muscle placed under the cover of the flexor and abductor muscles.

Origin

- (i) From the convexity of the hook of the hamate bone.
- (ii) From the flexor retinaculum.

Insertion

It is inserted into the whole length of the ulnar margin of the fifth metacarpal bone.

Nerve supply

By the deep branch of the ulnar nerve.

Action

It draws the fifth metacarpal bone forwards and rotates it laterally so as to deepen the hollow of the palm.

Q. What are the muscles in the middle of the palm and between the metacarpal bones ?

The following are the muscles in the middle of the palm and between the metacarpal bones :—

- (i) Lumbricales.
- (ii) Interossei.

Lumbricales

There are four small fleshy fasciculi which take origin from the tendons of the flexor digitorum profundus. The first and second fasciculi take origin from the radial side and the palmar surfaces of the tendons of the index and middle fingers respectively. The third fasciculus forms the adjacent sides of the tendons of the middle and ring fingers. The fourth fasciculus takes origin from the adjacent sides of the tendons of the ring and little fingers. Each passes to the medial side of the corresponding finger and is inserted into the base of the proximal phalanx.

Nerve supply

The first and second lumbricales are supplied by the median nerve. The third and fourth lumbricales are supplied by the deep terminal branch of the ulnar nerve. The third lumbricale also receives a twig from the median nerve.

Actions

They flex the digits at the metacarpophalangeal joint when they act with the interossei.

Interossei

They occupy the intervals between the metacarpal bones and are divided into dorsal and palmar sets.

Interossei Dorsals

They are four in number and bipinnate muscles. Each muscle arises by two tendons from the adjacent sides of the metacarpal bones. They are inserted into the bases of the proximal phalanges and the dorsal digital expanses.

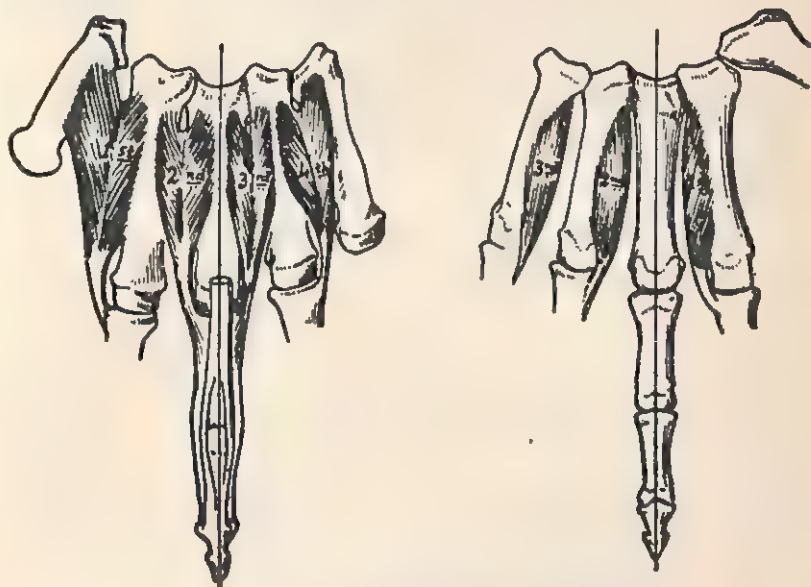


Fig. 36. (A) Dorsal Interossei of the hand.
(B) Volar Interossei of the hand.

The first interosseous is also known as the abductor indicis. It is inserted into the radial side of the proximal phalanx of the index finger. The second and third interossei are inserted into this middle finger—the second interosseus into the radial side and the third into the ulnar side of the middle finger. The fourth interosseus is inserted into the ulnar side of the proximal phalanx of the ring finger and the digital expanses.

Interossei palmaris

They are four in number and are placed upon the palmar surfaces of the metacarpal bones. The first interosseus is also known as the deep head of the flexor pollicis brevis and it arises from the ulnar side of the palmar surface of the base of the first

metacarpal bone and is inserted into the ulnar side of the base of the proximal phalanx. The second interosseus arises from the ulnar side of the second metacarpal bone and is inserted into the same side of the digital expansion of the index finger. The third interosseus arises from the radial side of the fourth metacarpal bone and is inserted into the radial side of the base of the proximal phalanx of the ring finger. The fourth interosseus arises from the radial side of the fifth metacarpal bone and is inserted into the radial side of the base of the proximal phalanx of the little finger.

Nerve supply

The dorsal and palmar interossei are supplied by the deep branch of the ulnar nerve.

Actions

The dorsal interossei abduct the fingers from the imaginary line drawn longitudinally through the centre of the middle finger.

The palmar interossei adduct the fingers from the imaginary line drawn longitudinally through the centre of the middle finger.

Q. What are the muscles that act as abductor of the arm? Describe one of them, its origin, insertion, nerve supply.

The chief muscles abducting the arm are as follows :—

1. Deltoides.
2. Supra spinatus.

Deltoides

It has got three origins e.g. (i) from clavicle, (ii) from acromion, (iii) from the spine of the scapula.

1. Clavicular origin—It takes origin from the anterior border and the upper surface of the 1/3 of the clavicle.
2. Acromion origin—It also takes origin from the lateral border of the acromion process.

3. Spine of the scapular origin.

It takes origin from the lower lip of the crest of the spine of the scapula.

Insertion

Into the deltoid tuberosity on the lateral side of the body of the humerus.

Nerve supply

The circumflex or axillary nerve.

BRACHIAL PLEXUS

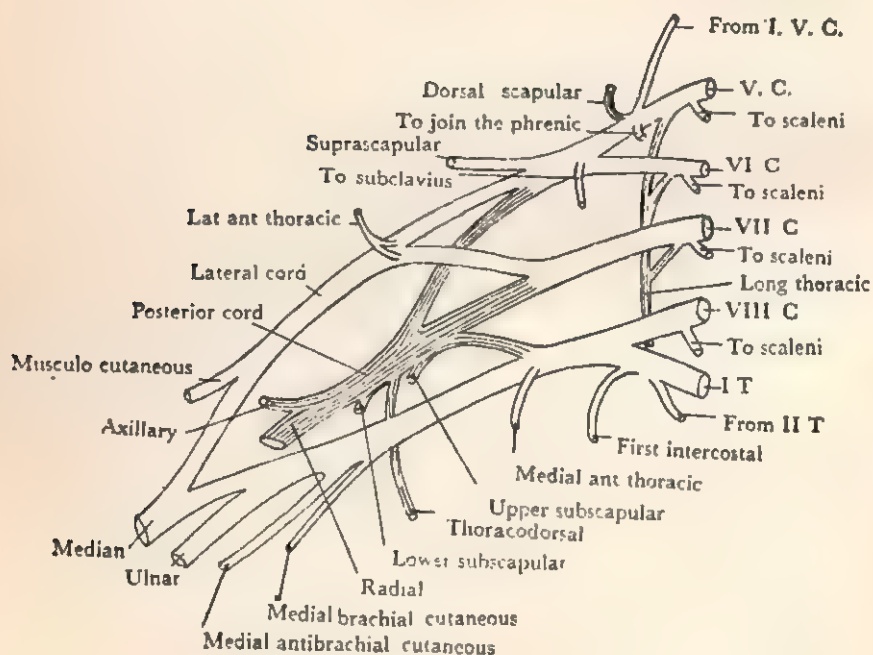


Fig. 37. The formation of the brachial plexus.

Q. Describe the formation of the Brachial Plexus. Mention the branches of the cords.

The brachial plexus is formed by the union of the primary rami of the lower four cervical nerves and the anterior primary ramus of the 1st thoracic nerve. The fifth cervical nerve receives a branch from the 4th cervical nerve and 1st thoracic nerve receives a branch from the 2nd thoracic nerve. They form the roots of the brachial plexus.

The 5th and the 6th cervical nerves unite to form the upper trunk at the lateral border of the scalenus medius.

The 8th cervical and the 1st thoracic nerves unite to form the lower trunk behind the scalenus anterior.

The 7th cervical nerve goes along and forms the middle trunk.

These three trunks divide into anterior and posterior divisions and they pass behind the clavicle.

The anterior divisions of the upper and the middle trunks unite to form the lateral cord of the brachial plexus and is situated on the lateral side of the axillary artery.

The anterior division of the lower trunk forms the medial cord of the brachial plexus. It passes at first behind the axillary artery and then lies on the medial side of the axillary artery.

The posterior divisions of all the three trunks unite to form the posterior cord of the brachial plexus. It is situated at first above and then lies behind the axillary artery.

Branches of the cords of the brachial plexus.

- | | | |
|-----------------|---|--------------------------------------|
| | { | 1. Lateral pectoral. |
| 1. Lateral Cord | | 2. Musculo-cutaneous. |
| | | 3. Lateral root of the median nerve. |

- | | | |
|-------------------|---|-------------------------------------------|
| 2. Medial Cord | { | 1. Medial pectoral. |
| | | 2. Medial cutaneous nerve of the forearm. |
| | | 3. Medial cutaneous nerve of the arm. |
| | | 4. Medial root of the median nerve. |
| | | 5. Ulnar nerve. |
| 3. Posterior Cord | { | 1. Upper subscapular. |
| | | 2. Nerve to latissimus dorsi. |
| | | 3. Lower subscapular. |
| | | 4. Circumflex or Axillary. |
| | | 5. Radial. |

Q. Describe the course and relation of the Musculo-cutaneous nerve.

The musculo-cutaneous nerve arises from the lateral cord of the brachial plexus just below the lower border of the pectoralis minor. It passes downwards and lateralwards and after piercing the Coraco-brachialis, it then passes between the Biceps and the Brachialis muscles and reaches the lateral side of the arm.

On the lateral side of the Biceps brachii, it pierces the deep fascia little below the elbow joint. It is then continued into the forearm as the Lateral antibrachial cutaneous nerve. It supplies the Coraco-brachialis and the Biceps brachii.

The lateral cutaneous nerve of the forearm passes deep to the cephalic vein. It then passes along the radial border of the forearm upto wrist. It supplies the skin of the lateral half of the volar surface of the forearm. At the wrist it lies in front of the radial artery and then runs to the base of the thenar eminence where it ends in cutaneous filaments.

At the end, it communicates with the terminal branch of the radial nerve and the palmar cutaneous branch of the median nerve.

MEDIAN NERVE

Q. Describe the course and relation of the median nerve from its origin to its wrist joint.

Median nerve**Arm**

The median nerve arises by two roots—one from the lateral cord and the other from the medial cord of the brachial plexus.

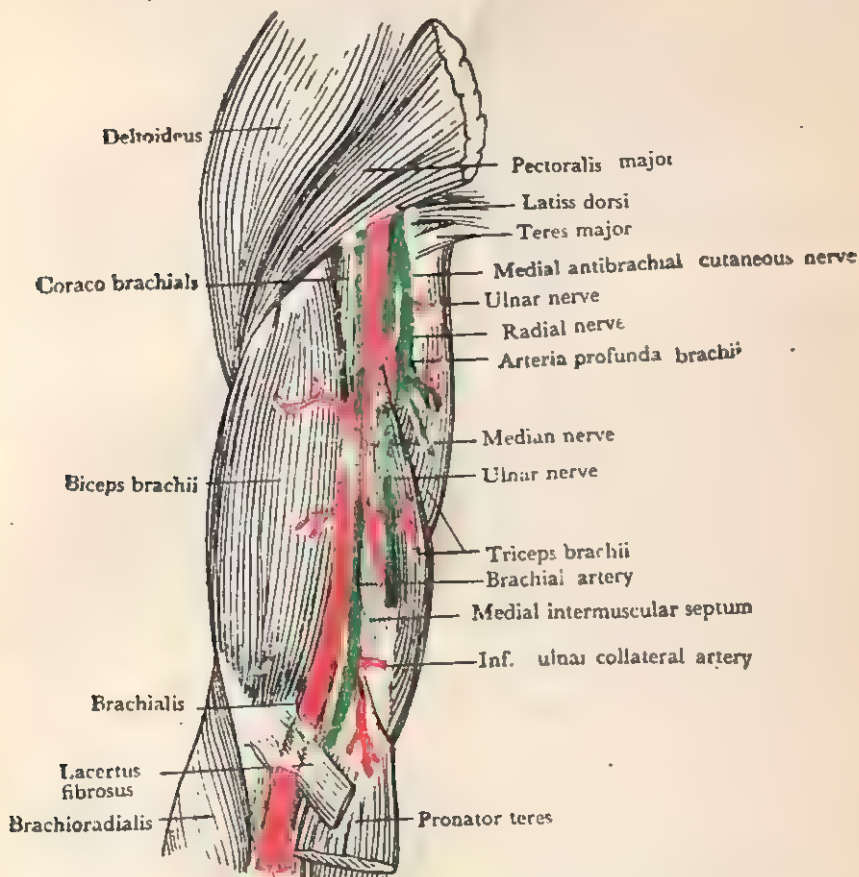


Fig. 38. Median Nerve in arm.

They meet at the lower part of the axillary, uniting either in front or on the lateral side of the axillary artery. As it passes through the arm, it lies at first on the lateral side of the brachial artery and then it crosses in front of the brachial artery just at the level of the insertion of the coraco-brachialis and then runs on its medial side up to the bend of the elbow where it lies behind the bicipital aponeurosis and is separated from the elbow joint by the brachialis.

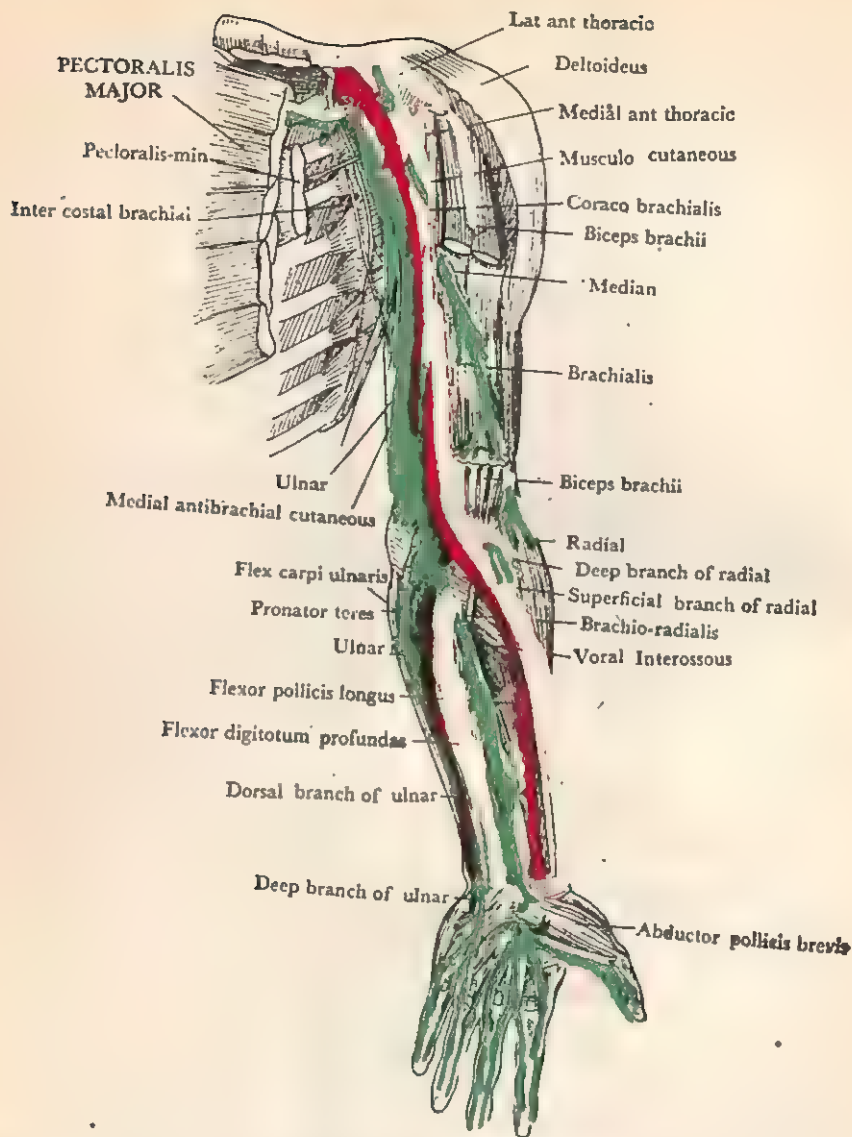


Fig. 39. Median Nerve in forearm and hand.

Forearm

In the forearm the median nerve passes between the two heads of the pronator teres and enters the forearm. Here it

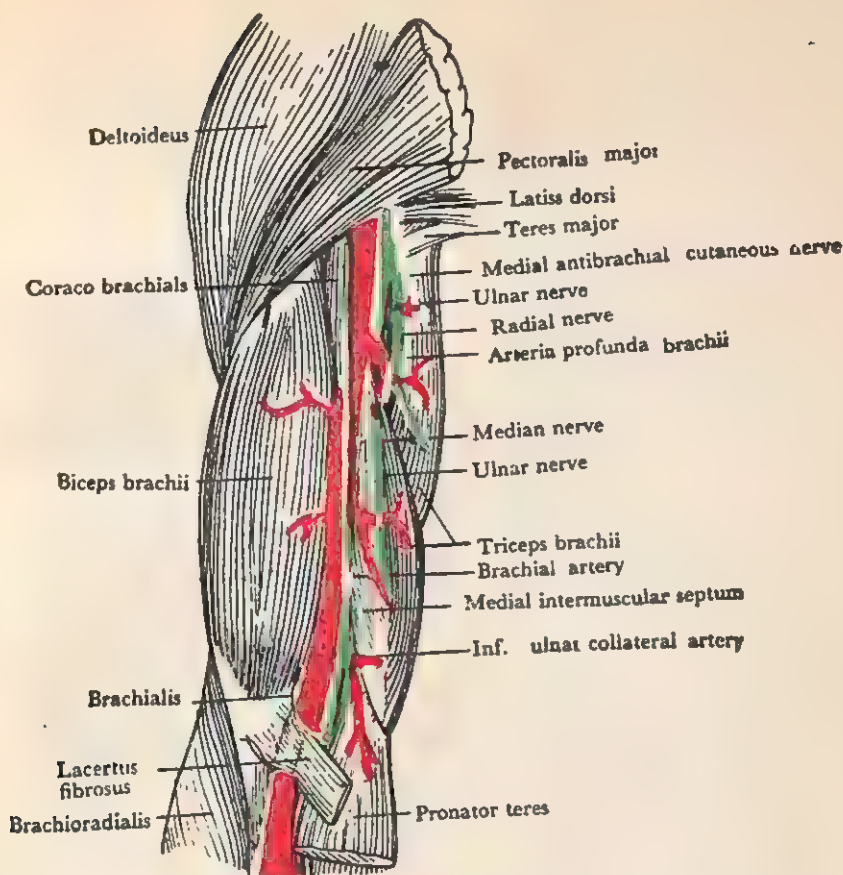


Fig. 40. Ulnar nerve in Arm.

crosses the ulnar artery, but is separated from the ulnar artery by the deep head of the pronator teres. In the forearm it passes behind the flexor digitorum sublimis and lying on the flexor digitorum profundus. It is accompanied by the median artery—a branch of the anterior interosseous artery in the forearm.

Wrist

At the wrist the median nerve lies between the tendon of the flexor digitorum sublimis and the flexor carpi radialis behind the tendon of the palmaris longus. It then passes behind the flexor retinaculum analem of the hand.

Q. Describe the course and relation of the Median nerve in the palm of the hand.

Palm of the Hand

In the palm of the hand. The median nerve is covered by the skin, palmar aponeurosis and the superficial palmar arch. It lies upon the tendons of the flexor muscles of the hand. It passes behind the flexor retinaculum and becomes enlarged.

It divides into—

(i) Lateral and (ii) medial portions.

1. The lateral portion of the median nerve supplies the abductor pollicis brevis, opponens pollicis and flexor pollicis brevis muscles. It then divides into three palmar digital nerves. The first and the second supply the sides of the thumb and the third gives a twig to the 1st lumbrical and supplies of the radial side of the index finger.

2. The medial portion of the median nerve divides into two palmar digital nerves. The first digital nerve gives a twig to the 2nd lumbrical and runs towards the cleft between the Index and the middle fingers. Here it divides into two collateral branches of the adjoining sides of the index and middle fingers.

The second digital nerve passes towards the cleft between the middle and ring fingers and divides into two collateral branches for the adjoining sides of the middle and ring fingers. It sends a twig to the third lumbrical and receives a communicating branch from the ulnar nerve.

Relations

The palmar digital nerve lie deep to the superficial palmar arch and the digital vessels arise from it.

The collateral digital nerves of the fingers lie in front of the corresponding arteries.

Each collateral digital nerve gives a dorsal branch opposite the base of the proximal phalanx and supplies the skin of the dorsal surface of the phalanx.

At the end of the digit, each collateral digital nerve divides into two branches. One supplies the pulp of the fingers and the other ramifies beneath the nails.

Q. Describe the course and relation of the ulnar nerve in the palm of the hand.

The ulnar nerve passes in front of the flexor retinaculum and passes lateral to the pisiform bone and behind the ulnar artery and then enters the palm with the artery and divides into superficial and deep branches.

Superficial terminal branch.—The superficial terminal branch supplies the skin on the medial side of the hand and the palmaris brevis. It then divides into two palmar digital nerves. One of these palmar digital nerve supplies the medial side of the little finger. The other divides into Collateral branches for the adjoining sides of the little and the ring fingers. It also gives a twig to join the median nerve.

Deep terminal branch.—The deep terminal branch follows the deep branch of the ulnar artery. It passes between the abductor digiti minimi and the flexor digiti minimi. After perforating the opponens digiti minimi it follows the course of the deep palmar arch behind the flexor tendons. It supplies the short muscles of the little finger. It also gives branches to the interossei and the third and the fourth lumbricals. It ends by supplying the abductor pollicis, the first palmar interosseus muscle. It also sends articular twigs to the wrist joint and sends a twig to the 3rd lumbrical and receives a communicating branch from the ulnar nerve.

Relations

The palmar digital nerves lie deep to the superficial palmar arch and the digital vessels arise from it.

The collateral digital nerves of the fingers lie in front of the corresponding arteries.

Each collateral digital nerve gives a dorsal branch opposite the base of the proximal phalanx and supplies the skin of the dorsal surface of the phalanx.

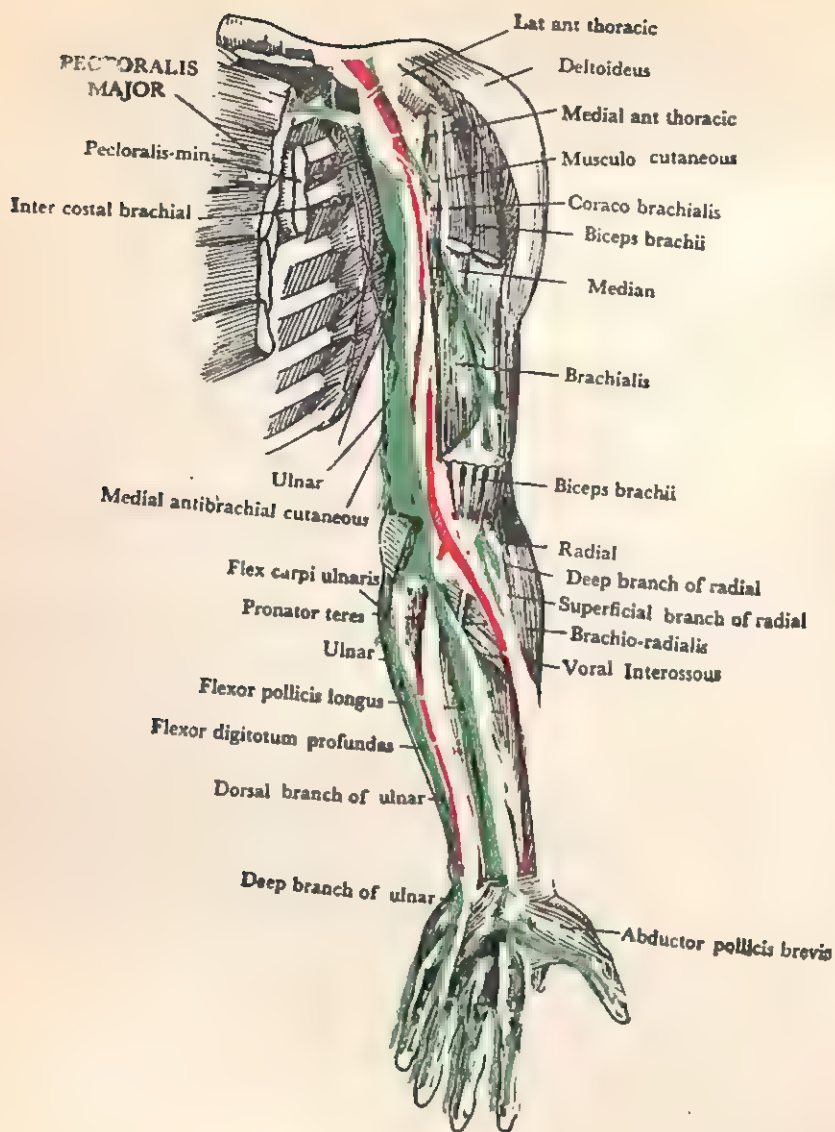


Fig. 41. Ulna Nerve in forearm.

Q. Describe the course and relation of the ulnar nerve from its origin to the wrist.

Arm

The ulnar nerve arises from the medial cord of the brachial plexus. It runs downwards through the axilla on the medial side of the axillary artery between the axillary artery and the axillary vein. It then runs downwards on the medial side of the brachial artery as far as the middle of the arm. Here it pierces the medial intermuscular septum and inclines medially in front of the medial head of the triceps brachii to reach the interval between the medial epicondyle of the humerus and the olecranon process of the ulna, accompanied by the ulnar collateral artery.

At the elbow it lies in a groove on the back of the medial epicondyle and enters the forearm.

Forearm

In the forearm it passes between the two heads of the flexor carpi ulnaris. Then it passes along the medial side of the forearm, lying upon the flexor digitorum profundus. Its upper half is covered by the flexor carpi ulnaris. Its lower half lies on the lateral side of the flexor carpi ulnaris and is covered by the skin and the fascia.

In the upper one-third of the forearm, the ulnar nerve is separated from the ulnar artery by a considerable interval, but the remaining portion of it lies close to the medial side of the ulnar artery. A just little above the wrist it gives off a dorsal branch and then runs downwards into the hand, passing in front of the flexor retinaculum, lateral to the pisiform bone and behind the ulnar artery.

Branches

- (i) Articular branches to the elbow joint.
- (ii) Muscular branches to the flexor carpi ulnaris and medial half of the flexor digitorum profundus.

RADIAL NERVE

Q. Describe the course and relations of the radial nerve. Mention its branches.

The radial nerve is one of the longest branches of the posterior cord of the brachial plexus. It runs behind the third

part of the axillary artery and the upper part of the brachial artery. It lies in front of the subscapularis and the tendon of the latissimus dorsi and the teres major. It is then accompanied by the arteria profunda brachii. It turns backwards and runs between the long and medial heads of the triceps brachii and runs obliquely across the back of the humerus under cover of the lateral head of the triceps brachii. After piercing the lateral intermuscular septum it enters the anterior compartment of the arm. It then runs between the brachialis and the brachioradialis and the extensor carpi radialis longus. When it reaches the front of the lateral epicondyle, it gives off the posterior interosseous nerve. It then runs on the lateral side of the upper two-third of the forearm, lying upon the supinator and lateral to the radial artery and behind the brachioradialis. In the middle one-third of the forearm it lies on the pronator teres, the flexor digitorum sublimis (radial head), the flexor pollicis longus. It leaves the artery a little above the wrist, passes deep to the tendon of the brachioradialis and then winds round the lateral side of the radius. It pierces the deep fascia and divides into four or five dorsal digital nerves, which are distributed in the following order :—

- (i) The first nerve supplies the skin of the radial side of the thumb and the adjoining part of the thenar eminence.
- (ii) The second nerve supplies the medial side of the thumb.
- (iii) The third nerve supplies the lateral side of the index finger.
- (iv) The fourth nerve supplies the adjoining sides of the index and middle fingers.
- (v) The fifth nerve communicates with a filament from the dorsal branch of the ulnar nerve.

The branches are distributed as below :—

Branches

- (i) Muscular—Triceps brachii, anconeus brachioradialis, extensor carpi radialis longus and brachialis.

- (ii) Cutaneous.
- (iii) Articular—Elbow joint.
- (iv) Posterior interosseous

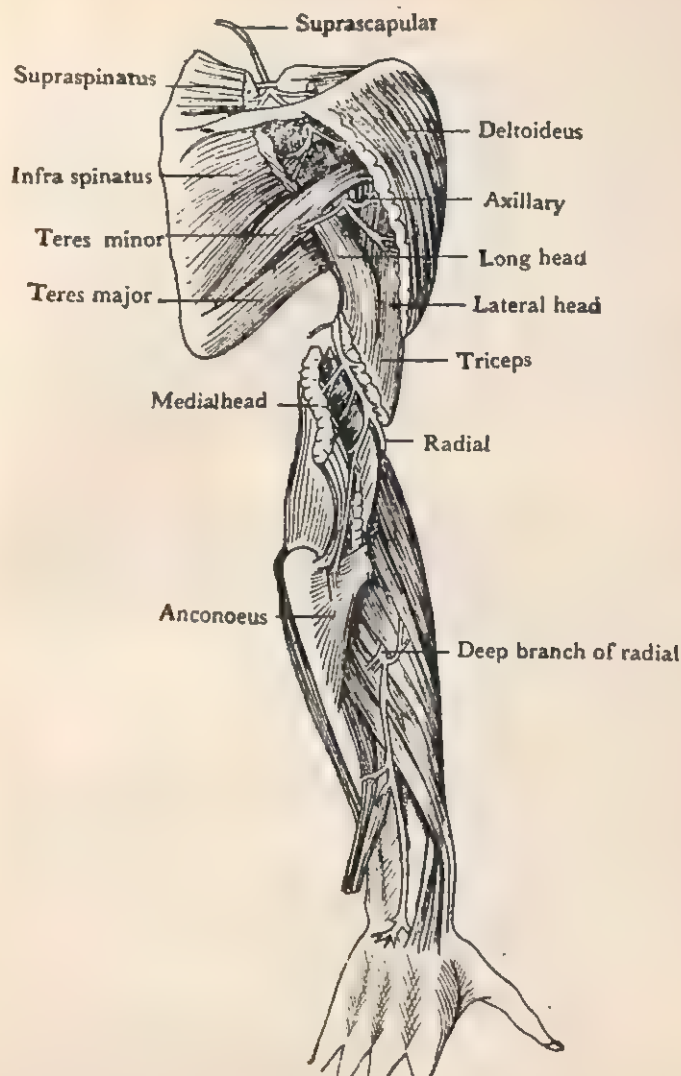


Fig. 42. Radial nerve.

AXILLARY NERVE

Q. Describe the course and relation of the axillary nerve (circumflex nerve) and the suprascapular nerve.

Axillary nerve

The axillary nerve arises from the posterior cord of the brachial plexus. It is situated behind the axillary artery and anterior to the subscapularis muscle. It then turns backwards at the lower border of the subscapularis muscle and then runs along the articular capsule of the shoulder joint with the posterior humeral circumflex artery. The nerve and the artery pass through a quadrilateral space which is bounded above by the subscapularis in front, by the teres minor behind, by the teres major below, by the long head of the triceps brachii medially and by the surgical neck of the humerus laterally. The axillary nerve terminates by dividing into an anterior branch and a posterior branch.

Anterior branch

The anterior branch is accompanied by the posterior humeral circumflex vessels. It turns round the surgical neck of the humerus beneath the deltoideus muscle. It supplies the muscles and gives off some cutaneous branches which supply the skin after piercing the deltoideus muscle.

Posterior branch

The posterior branch of the axillary nerve pierces the deep fascia and continues as the lateral brachial cutaneous nerve. It turns round the posterior border of the deltoideus muscle and supplies the skin over its lower portion and the skin over the long head of the triceps brachii. It supplies the teres minor and the posterior portion of the deltoid muscle.

Suprascapular Nerve

The suprascapular nerve springs from the upper trunk of the brachial plexus formed by the union of the fifth and sixth cervical nerves. It passes behind the trapezius and omohyoideus muscles. It then passes through the suprascapular notch and

enters the supraspinatus fossa. The nerve passes below the superior transverse scapular ligament. It then runs towards the lateral border of the spine of the scapula beneath the supraspinatus muscle and enters the infraspinatus fossa in company with the transverse scapular artery.

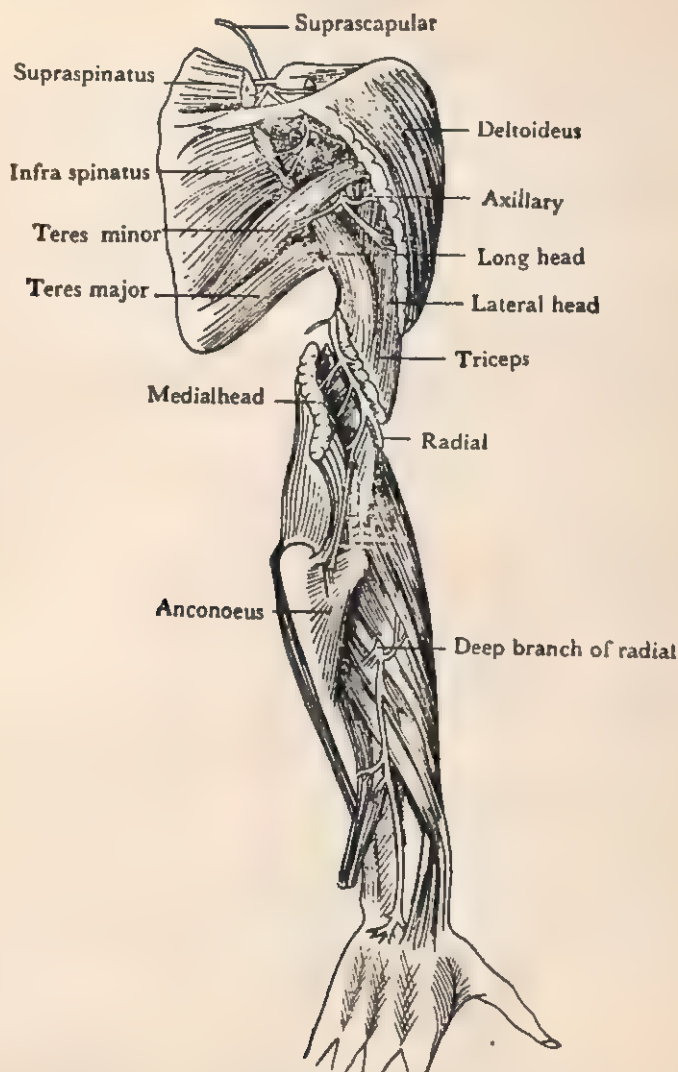


Fig. 43. *Supra scapu or, Axillary (Circumflex) and radial nerves.*

In the supraspinatus fossa it gives off branches to the supraspinatus muscle and the articular capsule of the shoulder joint and acromio-clavicular joint.

In the infraspinatus fossa, the nerve gives off branches to the infraspinatus and the shoulder joint.

Subscapular Nerve

Q. Describe briefly the subscapular nerve.

The subscapular nerve arises from the posterior cord of the brachial plexus. They are two in number, upper and lower.

Upper subscapular nerve

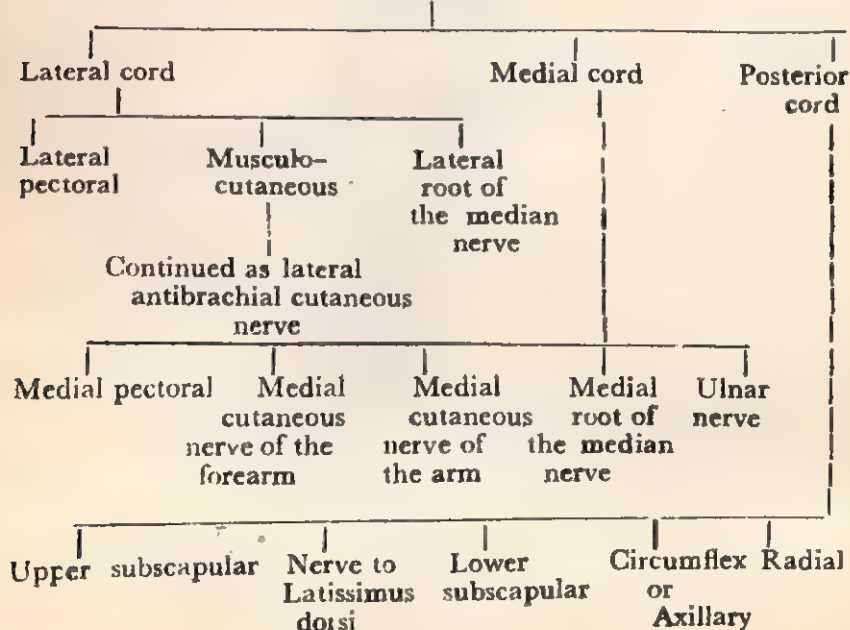
The upper subscapular nerve which is a smaller branch of the subscapular nerve enters the upper portion of the subscapularis muscle.

Lower subscapular nerve

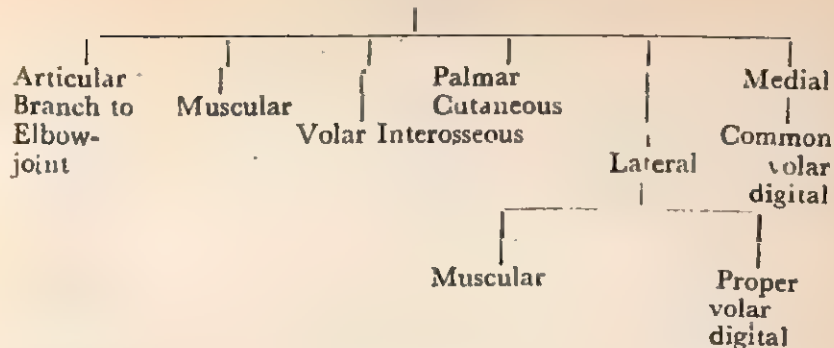
The lower subscapular nerve supplies the lower portion of the subscapular muscle and terminates in the teres major muscle.

Nerves of The Upper Extremity

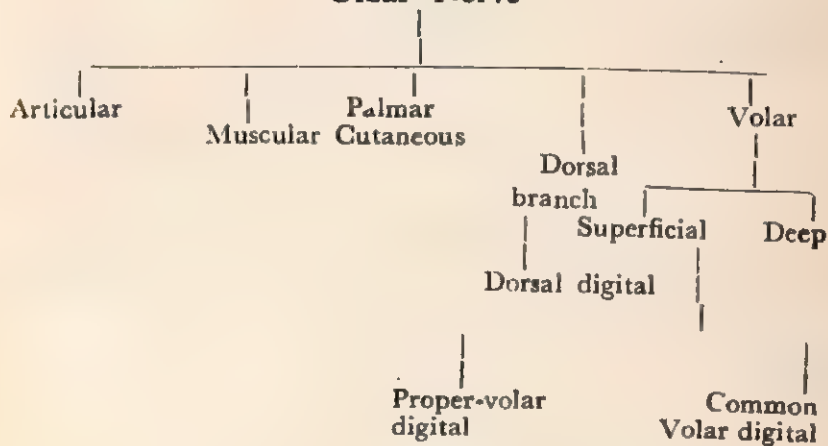
Brachial plexus.



Median Nerve

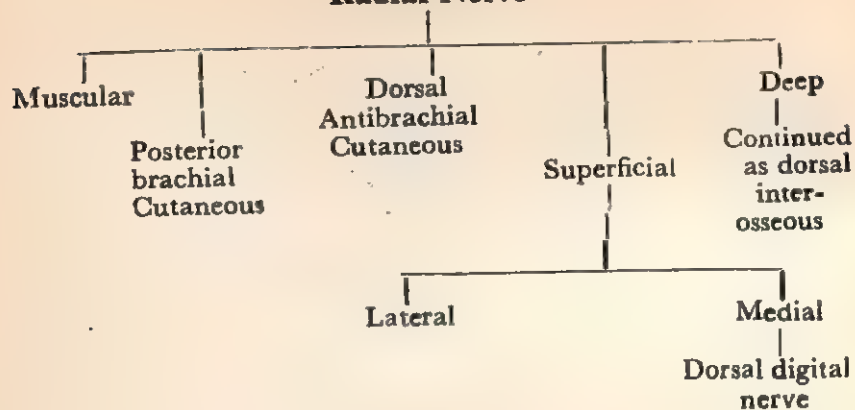


Ulnar Nerve



Axillary Nerve



Radial Nerve

The Sacrum

The sacrum is a wedged-shaped bone. It is formed by the fusion of the five sacral vertebrae. It lies in the upper and posterior portions of the pelvic cavity. It is placed between the two hip bones. Its upper part is the base which articulates with the fifth lumbar vertebra and forms the sacro-vertebral angle. Its lower part is the apex which articulates with the coccyx.

The sacrum consists of the following parts :—

- (i) Pelvic surface.
- (ii) Dorsal surface.
- (iii) Two lateral surfaces.
- (iv) Base.
- (v) Apex.
- (vi) Central canal.

Q. Describe the pelvic surface of the sacrum.

The pelvic surface of the sacrum is concave. It is crossed by four ridges transversely. The portions, separated by the ridges are the bodies of the sacral vertebrae.

The body of the first vertebra is large and resembles the lumbar vertebra. The rest of the sacral vertebrae diminishes in size from above downwards. There are four anterior sacral foramina on each side at the end of the ridges. These foramina open from the sacral canal and give exit to the anterior divisions of the sacral nerves and entrance to the lateral sacral arteries.

The ridges which are situated in between the lateral sacral foramina on each side form the costal elements. These costal elements are fused to the vertebrae. On the lateral side of the anterior sacral foramina, the costal elements unite anteriorly with one another and posteriorly unite with the transverse process forming the lateral part of the sacrum.

Each lateral part is transversed by four shallow grooves for the anterior divisions of the sacral nerves. The grooves are separated from each other by ridges which give origin to the piriformis muscle.

Q. Describe the dorsal surface of the sacrum.

The dorsal surface of the sacrum is convex. The median sacral crest is situated in the middle line. These are the rudimentary spinous processes of the upper three or four sacral vertebrae.

On each side of the median sacral crest is a groove known as the sacral groove. This sacral groove gives origin to the multifidus muscles. The floor of the sacral groove is formed by the union of the laminae of the vertebrae. Sometimes the laminae of the fifth sacral vertebra fails to unite posteriorly causing a deficiency known as hiatus sacralis situated in the posterior wall of the sacral canal. The hiatus sacralis transmits the following structures :—

- (i) Fifth pair of the sacral nerves.
- (ii) Single pair of the coccygeal nerves.
- (iii) Filum terminale of the medulla spinalis.

Lateral to the sacral groove is a series of small tubercles which are formed by the fusion of the articular processes. This is known as the sacral articular crests. The articular processes of the first sacral vertebra are large and their facets are circular in shape. They articulate with the facet on the inferior processes of the fifth lumbar vertebra. The inferior articular processes of the fifth sacral vertebra are prolonged downwards, known as the sacral cornua, which articulates with the cornua of the coccyx.

There are four posterior sacral foramina present lateral to the sacral crest. These foramina transmit the posterior divisions of the sacral nerves. Lateral to these posterior sacral foramina there is a series of tubercles which represent the ends of the fused transverse processes of the sacral vertebrae and are known as the lateral sacral crests. The transverse tubercles of the first and second sacral vertebrae give attachment to the short posterior sacro iliac ligaments. The transverse tubercle of the third sacral vertebra gives attachment to the long posterior sacro-iliac ligaments. The transverse tubercles of the fourth and fifth give attachment to the sacro tuberos ligaments.

Q. Describe the lateral surfaces of the Sacrum.

The lateral surfaces of the sacrum are broad above and narrow below. The upper part of each lateral surface has an ear-shaped surface known as auricular surface which articulates with the similar surface of the ilium. Behind the auricular surface, there is a rough area known as the sacral tuberosity which has three depressions for the attachment of the interosseous sacro-iliac ligament.

The lower portion is thin and gives attachment to the sacro-tuberos and sacro-spinous ligaments. Some fibres of the gluteus maximus are attached posteriorly and the coccygeus anteriorly.

It ends in a projection below known as the inferior lateral angle. There is a notch present on the medial side of the inferior lateral angle and is converted into a foramen by a transverse process of the first coccygeal vertebra. This foramina transmits the anterior division of the fifth sacral nerve.

Q. Describe the base of the sacrum.

The base of the sacrum is broad. It has an upper oval surface in the centre of the body of the first sacral vertebra which articulates with the undersurface of the body of the fifth lumbar vertebra. The anterior border of the body of the first sacral vertebra is very prominent and is known as the promontory. Behind the body is the superior orifice of the sacral canal. There is a large triangular plate of bone on either side of the body.

The ridges which are situated in between the lateral sacral foramina on each side form the costal elements. These costal elements are fused to the vertebrae. On the lateral side of the anterior sacral foramina, the costal elements unite anteriorly with one another and posteriorly unite with the transverse process forming the lateral part of the sacrum.

Each lateral part is transversed by four shallow grooves for the anterior divisions of the sacral nerves. The grooves are separated from each other by ridges which give origin to the piriformis muscle.

Q. Describe the dorsal surface of the sacrum.

The dorsal surface of the sacrum is convex. The median sacral crest is situated in the middle line. These are the rudimentary spinous processes of the upper three or four sacral vertebrae.

On each side of the median sacral crest is a groove known as the sacral groove. This sacral groove gives origin to the multifidus muscles. The floor of the sacral groove is formed by the union of the laminae of the vertebrae. Sometimes the laminae of the fifth sacral vertebra fails to unite posteriorly causing a deficiency known as hiatus sacralis situated in the posterior wall of the sacral canal. The hiatus sacralis transmits the following structures :—

- (i) Fifth pair of the sacral nerves.
- (ii) Single pair of the coccygeal nerves.
- (iii) Filum terminale of the medulla spinalis.

Lateral to the sacral groove is a series of small tubercles which are formed by the fusion of the articular processes. This is known as the sacral articular crests. The articular processes of the first sacral vertebra are large and their facets are circular in shape. They articulate with the facet on the inferior processes of the fifth lumbar vertebra. The inferior articular processes of the fifth sacral vertebra are prolonged downwards, known as the sacral cornua, which articulates with the cornua of the coccyx.

There are four posterior sacral foramina present lateral to the sacral crest. These foramina transmit the posterior divisions of the sacral nerves. Lateral to these posterior sacral foramina there is a series of tubercles which represent the ends of the fused transverse processes of the sacral vertebrae and are known as the lateral sacral crests. The transverse tubercles of the first and second sacral vertebrae give attachment to the short posterior sacro iliac ligaments. The transverse tubercle of the third sacral vertebra gives attachment to the long posterior sacro-iliac ligaments. The transverse tubercles of the fourth and fifth give attachment to the sacro tuberos ligaments.

Q. Describe the lateral surfaces of the Sacrum.

The lateral surfaces of the sacrum are broad above and narrow below. The upper part of each lateral surface has an ear-shaped surface known as auricular surface which articulates with the similar surface of the ilium. Behind the auricular surface, there is a rough area known as the sacral tuberosity which has three depressions for the attachment of the interosseous sacro-iliac ligament.

The lower portion is thin and gives attachment to the sacro-tuberos and sacro-spinous ligaments. Some fibres of the gluteus maximus are attached posteriorly and the coccygeus anteriorly.

It ends in a projection below known as the inferior lateral angle. There is a notch present on the medial side of the inferior lateral angle and is converted into a foramen by a transverse process of the first coccygeal vertebra. This foramina transmits the anterior division of the fifth sacral nerve.

Q. Describe the base of the sacrum.

The base of the sacrum is broad. It has an upper oval surface in the centre of the body of the first sacral vertebra which articulates with the undersurface of the body of the fifth lumbar vertebra. The anterior border of the body of the first sacral vertebra is very prominent and is known as the promontory. Behind the body is the superior orifice of the sacral canal. There is a large triangular plate of bone on either side of the body.

This plate is known as the ala sacralis. The upper surface of the ala sacralis is continuous with the iliac fossa. The posterior one-third of the ala forms the transverse process and the anterior two-thirds represents the costal process of the first sacral vertebra. The superior articular processes are attached to the body of the first sacral vertebra and to the alae by small pedicles. These superior articular processes are oval and concave and look backwards like the superior articular processes of the lumbar vertebrae. A notch is present on the upper surface of each pedicle known as a vertebral notch forming the lower portion of the foramen between the last lumbar and the first sacral vertebrae.

Apex

The apex has an oval facet for articulation with the coccyx.

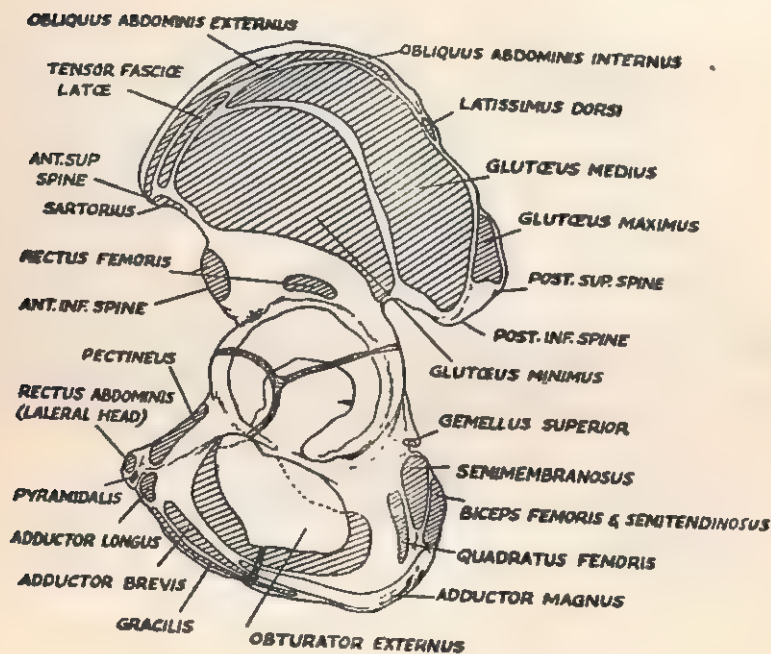


Fig. 44. The left hip bone. External surface.

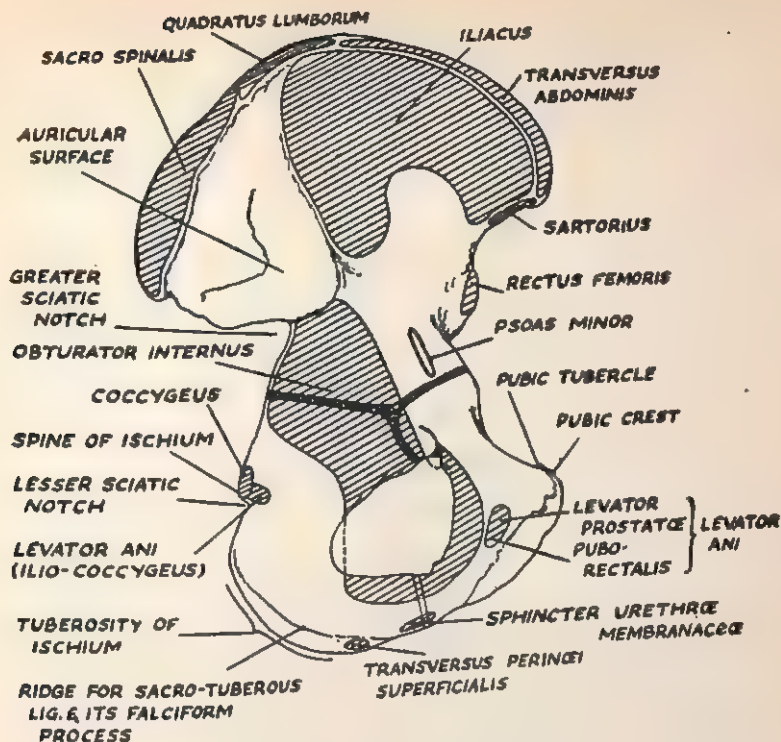


Fig. 45. The left hip bone. Internal surface.

THE HIP BONE

Q. What are the parts of the hip bone? Describe the gluteal or external surface of the ilium.

The following are the parts of the hip bone:—

1. Ilium.
2. Ischium.
3. Pubis.

They are united at the acetabulum in the adult.

Gluteal surface of the ilium:—

The gluteal or external surface of the ilium is bounded above by the crest of the ilium, below is bounded by the

upper margins of the acetabulum. Anteriorly, it is bounded by the anterior border, whereas posteriorly it is bounded by the posterior border.

The external surface is crossed by the three ridges or lines e.g. posterior gluteal line, anterior or middle gluteal line and inferior gluteal line.

The posterior gluteal line begins above from the crest of the ilium, 2 in front of the posterior superior iliac spine and ends below at the upper portion of the greater sciatic notch. Behind the line is a semilunar surface. The upper part of this surface is rough and gives origin to the gluteus maximus. The lower portion of the surface is devoid of muscular attachment.

The anterior or middle gluteal line begins near the crest, 4 cm. behind the anterior superior iliac spine and runs backwards and lateralwards and ends in the upper part of the greater sciatic notch. It is one of the largest gluteal line.

The surface which is lying between the crest, the anterior and the posterior gluteal lines gives origin to the gluteus medius.

The inferior gluteal line begins from the notch on the anterior border and runs backwards and ends near the middle of the greater sciatic notch. It is one of the smallest gluteal line and is very indistinct. The surface between the anterior or middle and inferior gluteal line gives origin to the gluteus minimus.

Just above the acetabulum there is a groove which gives origin to the reflected tendon of the rectus femoris.

Q. Describe the sacro-pelvic or internal surface of the ilium.

The sacro-pelvic surface of the ilium is divided into anterior and posterior divisions.

1. **Anterior division**—The anterior division of the sacro-pelvic surface is again sub-divided by means of an arcuate line into a smaller portion which lies below the arcuate line or ilio pectineal line and forms the lateral wall of the true pelvis. It gives origin to the obturator internus, whereas the larger

portion which lies above the arcuate line is the iliac fossa. It is concave and smooth. It gives origin to the iliacus muscle. The arcuate line gives insertion to the psoas minor.

2. Posterior division:—The posterior division of the sacro-pelvic surface is sub-divided into three portions.

(i) Auricular portion.

(ii) Ligamentous portion.

(iii) Muscular portion.

Auricular portion:—The auricular portion articulates with the auricular surface of the sacrum.

Ligamentous portion:—The ligamentous portion is situated behind the auricular area. It gives attachment to the posterior sacro-iliac ligament.

Muscular area:—The muscular area is situated superiorly and gives origin to the multifidus muscle.

Q. Describe the crest or superior border of the ilium.

(Agra University, G. H. M. S., 1966)

A. The crest of the ilium is thick, convex and curved. It is thinner in the middle portion. Anteriorly, it ends in the anterior superior iliac spine which gives attachment to the inguinal ligament and origin of the sartorius muscle.

Posteriorly, it ends in the posterior superior iliac spine which gives attachment to the long posterior sacro-iliac ligament.

The crest has got an external lip, an internal lip and an intervening space.

The external lip gives attachment to the following muscles :
(1) Tensor fasciae latae, (2) Obliquous externus abdominis, and (3) Latissimus dorsi from anterior to the posterior side or from above downwards. The fascia lata is attached on the whole length of the external lip of the crest of the ilium.

The internal lip of the crest gives attachment to the following muscles :—

- (i) Transversus abdominis.
- (ii) Quadratus lumborum.
- (iii) Sacro-spinalis or Erector spine.
- (iv) Iliacus muscle.
- (v) Fascia iliaca.

The Intermediate line or space :—It gives attachment to the oblique internus abdominis.

Q. Describe the ischial tuberosity or tuberosity of the ischium.

The posterior surface of the superior ramus of the ischium forms a large swelling which is known as the ischial tuberosity or the tuberosity of the ischium. It has two portions :

- (i) A lower triangular portion.
- (ii) An upper quadrilateral portion.

The lower triangular portion is subdivided into lateral and medial parts by means of a vertical ridge.

The lateral part gives origin to the adductor magnus, whereas the medial part gives attachment to the sacro-tuberous ligament.

The upper quadrilateral portion is subdivided into an upper and lateral portions and the lower and medial portion by means of an oblique ridge which is running downwards and lateral-wards.

The upper and lateral portion gives origin to semi-membranous muscle, whereas the lower and medial portion gives origin to the semi-tendinosus and the long head of the biceps femoris.

Q. Write short notes on :—

- (i) Greater sciatic notch.
- (ii) Lesser sciatic notch.
- (iii) Pubic crest.

Greater sciatic notch

The greater sciatic notch is situated on the posterior border of the ilium. It is separated from the lesser sciatic notch by means of ischial spine. It is formed by ischium and ilium. Above the ischial spine is the greater sciatic notch which is converted into a foramen by means of sacro-tuberous ligament. The following structures pass from the pelvis through the greater sciatic foramen :—

- (i) Piriformis muscle.
- (ii) Superior and the Inferior gluteal vessels and nerves.
- (iii) Sciatic nerve.
- (iv) Posterior femoral cutaneous nerve.
- (v) Internal pudendal vessels and the nerve to the obturator Internus and quadratus femoris.

Out of these the superior gluteal vessels and nerves pass above the piriformis muscle while the other structures pass below the piriformis muscle.

Lesser sciatic notch

The lesser sciatic notch situated behind and above the ischial tuberosity and lies between the ischial spine and the ischial tuberosity. It is situated below the spine and is converted into a foramen by sacro-tuberous ligament and sacro-spinus ligament.

The obturator internus with its nerve supply and the internal pudendal vessels and nerve pass through the lesser sciatic foramen.

Pubic Crest.

Medial to the pubic tubercle is the pubic crest. It is thick and is about 2 cm. long. It gives attachment to the following structures :—

- (i) Superior crus of the sub-cutaneous inguinal ring.
- (ii) Aponeurosis of the obliquous externus by means of inguinal ligament.

(iii) The conjoined tendon of the obliquous internus abdominis and transversus abdominis.

(iv) Pyramidalis.

(v) Lateral head of the rectus abdominis.

THE OS PUBIS

Q. Describe the superior ramus of the os pubis.

The superior ramus is the continuation of the body of the os pubis. It is directed medialwards where it articulates with the opposite side of the bone.

For descriptive purposes it is divided into two portions, medial and lateral.

Medial portion

The medial portion of the superior ramus is smooth and flat. It has two surfaces, external and internal, and three borders.

Surfaces

External surface

The external surface of the medial portion of the superior ramus is directed downwards and lateralwards. It gives origin to the adductor longus below the pubic crest, obturator externus more posteriorly adductor brevis and upper portion of the gracilis.

Internal surface

The internal surface of the medial portion of the superior ramus of the os pubis is convex and smooth. It forms part of the anterior wall of the lesser pelvis. It gives origin to the levator ani, the obturator internus and the pubo-prostatic ligaments.

Borders

Upper border

The upper border of the medial portion of the superior ramus of the os pubis has a prominent tubercle known as the pubic tubercle. Two ridges run from the pubic tubercle to the lateral portion of the superior ramus of the os pubis.

The upper ridge known as the pecten-pubis runs upwards and lateralwards and becomes continuous with the arcuate line.

The lower ridge known as the obturator crest which runs lateralwards and then curves downwards in front of the acetabular notch.

Medial to the pubic tubercle is the pubic crest.

The pubic tubercle gives attachment to the aponeurosis of the obliquus externus by means of inguinal ligament.

The pecten pubis gives attachment to the lacunar ligament.

The pubic crest gives attachment to the superior crus of the subcutaneous inguinal ring.

Behind these attachments the conjoined tendon of the obliquus internus and the transversus abdominis (falx inguinalis) is inserted into the pubic crest and pecten pubis. The lateral head of the rectus abdominis and the pyramidalis take origin from the pubic crest.

Borders

Medial border

The medial border has an oval articular facet which articulates with the opposite side of the bone. The inter-pubic fibrocartilage lies between the bones.

Lateral border

The lateral border has a sharp margin known as the obturator crest. It forms a part of the circumference of the obturator foramen.

Lateral portion of the superior ramus

It has three surfaces, antero-superior, postero-superior and inferior.

Surfaces

Antero-superior surface

The antero-superior surface is bounded on its posterior side by the pecten pubis, anterior side by the obturator crest and lateral side by the iliopectineal eminence which gives origin to the pectineus.

Postero-superior surface (pelvic surface)

It is bounded above by the pecten : pubis and below by the border of the obturator foramen. It forms a small part of the bony wall of the lesser pelvis. It gives origin to some fibres of the obturator internus.

Inferior surface

It has a deep groove surface. It transmits the obturator nerve and vessels.

Q. Describe the Inferior ramus of the os Pubis.

The inferior ramus of the os Pubis is thin and flat. It passes backwards and downwards and joins with the inferior ramus of the ischium below the obturator foramen. It has two surfaces viz. (1) an external or anterior surface and (2) an internal or posterior surface. It also possesses two borders medial and lateral.

Surfaces :—**1. External or Anterior surfaces—**

The external or anterior surface is rough and gives origin to the following muscles :—

- (i) A portion of the obturator externus.
- (ii) Adductor brevis.
- (iii) Adductor magnus.

2. Internal surface or Posterior surface—

The internal surface or the posterior surface is smooth. It gives origin to the following muscles :—

- (i) Obturator Internus.
- (ii) Sphincter urethrae membranaceæ.

Borders

1. Medial border—The medial border is thick and everted. It has got two ridges and an intervening space. The outer ridge gives attachment to the fascia of collis or superficial perineal fascia.

The inner ridge gives attachment to the inferior fascia of the urogenital diaphragm.

2. Lateral border—The lateral border is thin and forms a part of the circumference of the obturator foramen. It gives attachment to the obturator membrane.

Q. Write short notes on the following —

- (i) **Pubic tubercle**
- (ii) **Pecten pubis**
- (iii) **Obturator crest**
- (iv) **Pubic crest**
- (v) **Ischial spine**

Pubic tubercle

The upper border of the medial portion of the superior ramus of the os pubis has a prominent tubercle known as the pubic tubercle. The pubic tubercle gives attachment to the aponeurosis of the obliquus externus by means of inguinal ligament.

Pecten pubis

From the pubic tubercle a ridge runs lateralwards to the lateral portion of the superior ramus of the os pubis. This ridge runs upwards and lateralwards and becomes continuous with the arcuate line.

The pecten pubis gives attachment to the lacunar ligament and the falx inguinalis (conjoined tendon of the obliquus internus and the transversus abdominis).

Obturator crest

From the pubic tubercle another ridge runs lateralwards to the lateral portion of the superior ramus of the os pubis. This ridge curves downwards to the front of the acetabular notch. It forms a portion of the circumference of the obturator foramen. It gives attachment to the obturator membrane.

Pubic crest

The pubic crest is situated on the medial side of the pubic tubercle. The crest gives origin to the pyramidalis and the lateral

head of the rectus abdominis. It also gives attachment to the superior crus of the subcutaneous inguinal ring.

Ischial spine

From the medial border of the body of the ischium a pointed triangular eminence projects. This eminence is known as the ischial spine.

The ischial spine has external and internal surfaces and a pointed extremity.

The external surface of the ischial spine gives origin to the gamellus superior.

The internal surface of the ischial spine gives attachment to the coccygeus, the levator ani and the pelvic fascia.

The pointed extremity of the spine gives attachment to the sacro-spinous ligament.

THE ISCHIUM

Q. Describe the superior ramus of the ischium.

The superior ramus of the ischium looks downwards and backwards from the body of the ischium. It has three surfaces—external, internal and posterior.

External surface

The external surface is quadrilateral in form. At its upper part there is an oblique groove which lodges the tendon of the obturator externus.

The lower portion is continuous with the external surface of the inferior ramus of the ischium. It is bounded in front by the posterior border of the obturator foramen, and behind by a ridge which separates the external surface from the posterior surface.

The external surface in front of the ridge gives origin to the quadratus femoris and some fibres of the obturator externus. Its lower portion gives origin to a portion of the adductor magnus.

Internal surface

The internal surface of the ischium is smooth and forms a part of the bony wall of the lesser pelvis. It is bounded in front by the posterior margin of the obturator foramen, and below and behind by a ridge which gives attachment to the falciform process of the sacro-tuberous ligament and gives origin to the transversus perinae superficialis and the ischio-cavernous more anteriorly.

Posterior surface

The posterior surface of the ischium forms a large tuberosity known as the ischial tuberosity. It consists of two portions, upper and lower.

Lower portion of the ischial tuberosity

The lower portion of the ischial tuberosity is triangular in shape. It is divided into two parts—medial and lateral—by a longitudinal ridge.

The medial portion gives attachment to the sacro-tuberous ligament and the lateral portion gives attachment to the adductor magnus.

Upper portion of the ischial tuberosity

The upper portion of the ischial tuberosity is smooth and quadrilateral. It is subdivided into two portions—upper-lateral and lower-medial—by an oblique ridge which runs downwards and lateralwards.

The upper-lateral portion gives origin to the semi-membranosus, and the lower-medial portion gives origin to the semi-tendinous and the long head of the biceps femoris.

Q. Describe the inferior ramus of the ischium.

The inferior ramus of the ischium is thin and flat. It is in continuation of the superior ramus and joins with the inferior ramus of the os pubis. Its joining is marked by a raised line. It

has two surfaces, external and internal, and two borders, lower and upper.

Surfaces

External surface

The external surface of the inferior ramus gives origin to the obturator externus and some fibres of the adductor magnus.

Internal surface

The internal surface of the inferior ramus forms part of the anterior bony wall of the lesser pelvis. It gives attachment to the sphincter urethrae membranaceae.

Borders

Upper border

The upper border of the inferior ramus of the ischium is thin and forms a portion of the medial margin of the obturator foramen.

Lower border

The lower border of the inferior ramus is thick, rough and everted. It forms the out-let of the pelvis. It has two lips and an intermediate space. The lips are in continuation with the lips of the inferior ramus of the os pubis. The external lip gives attachment to the deep layer of the superficial perinaeal fascia (fascia of colles). The internal lip gives attachment to the inferior fascia of the urogenital diaphragm. These two lips (ridges) join when they are traced backwards. The transversus perinaei superficialis takes origin from the space in front of their junction. The transversus perinaei superficialis, the ischio-cavernosus and the crus penis vel clitoridis are attached in front of the transversus perinaei superficialis.

Q. What are the differences between the male and the female pelvis.

The following are the differences of the male and the female pelvis:—

Female pelvis	Male pelvis
<ol style="list-style-type: none"> 1. The bones are smooth and light. 2. The whole pelvis is light. 3. The greater sciatic notch is wider. 4. The acetabulam are wide apart. 5. The obturator foramen is triangular in shape. 6. The sacrum is shorter and wider and its upper part is less curved. 7. The coccyx is more movable. 8. The ischial tuberosity is everted and wider. 9. The body of the pubis is quadrilateral in shape. 10. The ischial spine projects less into the pelvic cavity. 11. The symphysis pubis is shallower. 12. The pubic arch is more wider. 13. The auricular surfaces for articulation with the sacrum involve only two vertebrae. 	<ol style="list-style-type: none"> 1. The bones are heavier and rough. 2. The whole pelvis is heavy. 3. The greater sciatic notch is narrower. 4. The acetabulam are not so wide apart. 5. The obturator foramen is oval in shape. 6. The sacrum is narrower and longer. 7. The coccyx is less movable. 8. The ischial tuberosity is inverted and not so wide apart. 9. The body of the pubis is triangular in shape. 10. The ischial spine projects more to the pelvic cavity. 11. The symphysis pubis is deeper. 12. The pubic arch is less wider. 13. The auricular surfaces for articulation with the sacrum involve two and a half or three vertebrae.

FEMUR

Q. Describe the upper end of the Femur.

(*Homoe Board, B. M. S., 1965*)

The upper end of the Femur has got a head, a neck, a greater trochanter and a lesser trochanter.

The Head

The head is hemispherical in shape. Its surface is smooth and near about its centre there is an ovoid depression which is known as *Fossa capitis femoris* which gives attachment to the *ligamentum teres* of the hip joint. The head articulates with the acetabulum of the hip bone.

Neck

The neck of the femur is flat antero-posteriorly. The anterior surface is perforated by numerous foramina for nutrient vessels.

The posterior surface is concave and has got a shallow groove for the tendon of the *obturator externus*. The articular capsule is attached to the posterior surface of the neck just above the Intertrochanteric crest.

The superior border is thick and short.

The inferior border is narrow and long and ends at the lesser trochanter.

Greater trochanter

The greater trochanter is situated on the lateral side at the junction of the neck with the upper part of the body of the femur. It is a large eminence and quadrilateral in shape. It has got three surfaces, lateral, medial and anterior. It has also three borders, superior, inferior and posterior.

Surfaces

1. **Lateral surface**—The lateral surface is quadrilateral in shape and marked by an oblique ridge. This ridge runs from the postero-superior to the anterior inferior angle. The ridge gives insertion to the tendon of the *gluteus medius*. Above and in front

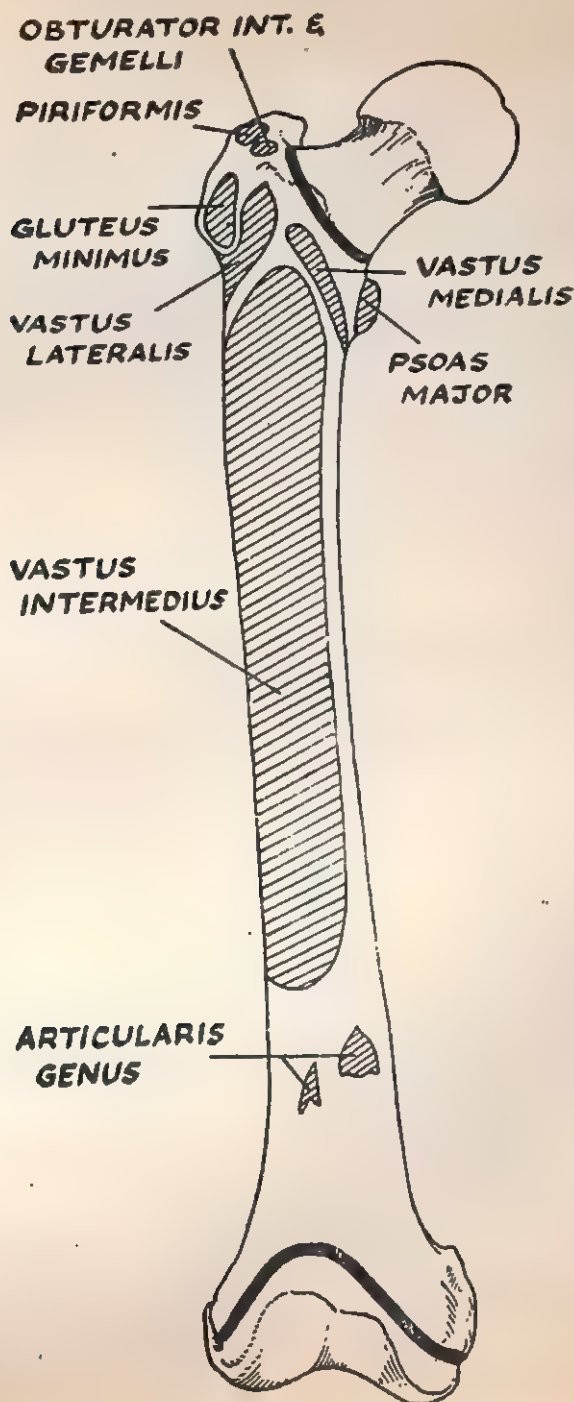


Fig. 46. The right femur. Anterior aspect.

of the ridge is a triangular surface. A bursa is interposed between the bone and the muscle.

Below and behind the ridge is a smooth triangular surface. The tendon of the gluteus maximus glides over this surface and a bursa is interposed between the muscle and the bone.

2. Medial surface—The medial surface is small. At its lower part there is a deep depression which is known as the trochanteric fossa which gives insertion to the tendon of the obturator externus. There is an impression just above the trochanteric fossa which gives insertion to the obturator internus and two gemelli, superior and inferior.

3. Anterior surface—The anterior surface is quadrilateral in shape and gives insertion to gluteus minimus.

Borders

1. Superior border—The superior border is thick, curved and free.

There is an impression near its centre which gives insertion to the piriformis muscle.

2. Inferior border—The inferior border lies between the upper part of the lateral surface of the body of the femur and the greater trochanter. There is a ridge on the surface. This ridge gives origin to the upper part of the vastus lateralis.

3. Posterior border—The posterior border is rounded and forms the boundary of the posterior part the trochanteric fossa and it forms the upper part of the Intertrochanteric crest.

Lesser trochanter—The lesser trochanter is a small, conical eminence projecting from the upper part of the body near the posterior part of the neck. The tip of the lesser trochanter is rough and gives insertion to the Psoas major muscle.

From the lesser trochanter three borders run. Two of these run upwards e. g.—

1. A medial is continuous with the lower border of the neck.

2. A lateral is continuous with the Intertrochanteric crest.

The third border or inferior border runs downwards and is continuous with the middle division of the line aspera.

Q. Write short notes on :—

1. Intertrochanteric crest.
2. Intertrochanteric line.
3. Linea Quadrata.

1. Intertrochanteric crest

One prominent ridge runs obliquely downwards and medialwards from the summit of the Greater trochanter on the posterior surface of the neck of the femur to the lesser trochanter. This ridge is known as Intertrochanteric crest.

Its upper part forms the posterior boundary of the greater trochanter. A little above the crest, the articular capsule of the hip joint is attached.

2. Intertrochanteric line—A line runs downwards and medialwards from the tubercle, situated at the junction of the upper part of the anterior surface of the neck with the greater trochanter of the femur and ends 5 cm. below the lesser trochanter. This line is known as Intertrochanteric line. Its upper half gives attachment to the lateral part of the Ilio femoral ligament of the hip joint. The lower half gives attachment to the medial part of the Ilio Femoral and pubo-capsular ligaments.

3. Linea Quadrata—A vertical ridge runs downwards from the middle of the intertrochanteric crest to the linea aspera between the lateral and intermediate ridges of the linea aspera. This ridge is known as linea quadrata. It gives attachment to the quadratus femoris and a few fibres of the adductor magnus.

Q. Describe the linea aspera.

The linea aspera or the posterior border is the longitudinal crest on the middle third of the body of the femur. It has got a medial and a lateral lip and a narrow rough intermediate line. These three ridges run upwards from the linea aspera.

The lateral ridge runs upwards to the base of the greater trochanter. It is known as the gluteal tuberosity which gives insertion to gluteus maximus.

The intermediate ridge or pectineal line runs upwards to the base of the lesser trochanter and gives insertion to the pectineus.

The medial ridge or spiral line is continuous with the intertrochanteric line.

The lips of the linea aspera diverge below and are prolonged downwards as two epicondylar ridges.

The lateral epicondylar ridge is prominent and ends at the lateral epicondyle.

The medial epicondylar ridge is indistinct and ends at the medial epicondyle in the adductor tubercle which gives insertion to the adductor magnus.

The vastus medialis takes origin from the medial lip of the linea aspera.

The vastus lateralis takes origin from the lateral lip of the linea aspera.

The adductor magnus is inserted into the intermediate line of the linea aspera.

Between the vastus lateralis and adductor magnus, the gluteus maximus is inserted above and the short head of biceps the femoris takes origin from below.

Between the vastus medialis and adductor magnus four muscles are inserted e. g. the iliacus and the pectineus above; and the adductor brevis and the adductor longus below.

THE TIBIA

Q. Describe the upper end of the tibia.

The upper end of the tibia has got two eminences known as the medial and lateral condyles.

The anterior surface of the two condyles are continuous with one another to form a large triangular area. This triangular

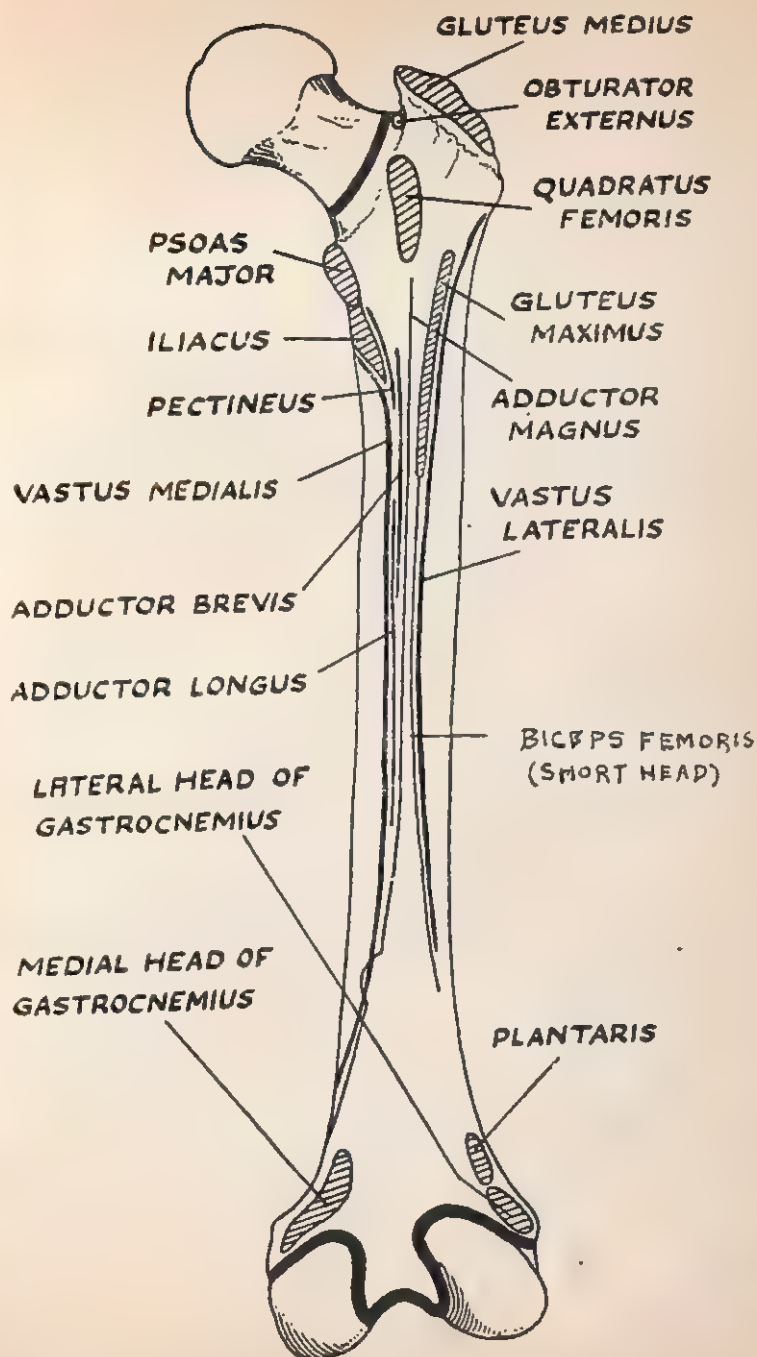


Fig. 47. The right femur. Posterior aspect.

area is perforated by the foramina for nutrient vessels. Just below the triangular area there is a tuberosity which gives attachment to the ligamentum patellae.

The superior surface has got two articular surfaces, medial and lateral.

The medial articular surface is oval, whereas the lateral articular surface is circular in shape.

The central portion of the medial and lateral articular surfaces articulates with the condyles of the femur. The peripheral portion of the surfaces gives attachment to the menisci of the knee joint. Between the articular surfaces is the intercondyloid eminence or tibial spine. In front and behind the intercondyloid eminence there are two rough depressions known as the anterior and posterior intercondyloid fossae for the attachment of the cruciate ligaments of the knee joint.

The medial condyle has a groove on the posterior surface. It gives insertion to the semi-membranous.

The medial surface of the medial condyle is convex and gives attachment to the posterior part of the tibial collateral ligament of the knee joint.

The lateral condyle has a small circular facet for articulation with the head of the fibula.

The lateral surface of the lateral condyle is rough and convex which gives insertion to a small slip of the biceps femoris and origin to a small part of the extensor digitorum longus.

Q. Describe the posterior surface of the body of the tibia.

The posterior surface of the body of the tibia lies between the interosseous crest and the medial border. The upper part of the body is crossed by an oblique ridge known as soleal line or oblique line or popliteal line which runs from the fibular facet to the medial border at the junction of the upper with the middle 1/3rd of the bone.

This oblique line gives attachment to the following structures :

1. Popliteal fascia,
2. Parts of the soleus.
3. Flexor digitorum longus.
4. Tibialis posterior.

Above the oblique line is the triangular area which gives insertion to the popliteus muscle.

Below the line is the orifice for a large branch of the posterior tibial artery.

The middle 1/3rd of the posterior surface is subdivided into two areas by means of a vertical ridge which begins from the middle of the popliteal line into medial and lateral areas.

The medial area is narrow and gives origin to the flexor digitorum longus.

The lateral area is narrow and gives origin to a portion of the tibialis posterior.

The lower portion of the posterior surface is smooth and covered by the following muscles :—

- (i) Tibialis posterior.
- (ii) Flexor digitorum longus.
- (iii) Flexor hallucis longus.

THE FIBULA

Q. Describe the body or shaft of the fibula.

The body or shaft of the fibula has four borders and four surfaces :

The four borders are :—

- (i) Antero-lateral or Anterior.
- (ii) Antero medial or Interosseous crest.
- (iii) Postero-lateral or Posterior,
4. Postero-medial.

The four surfaces are :—

- (i) Anterior.

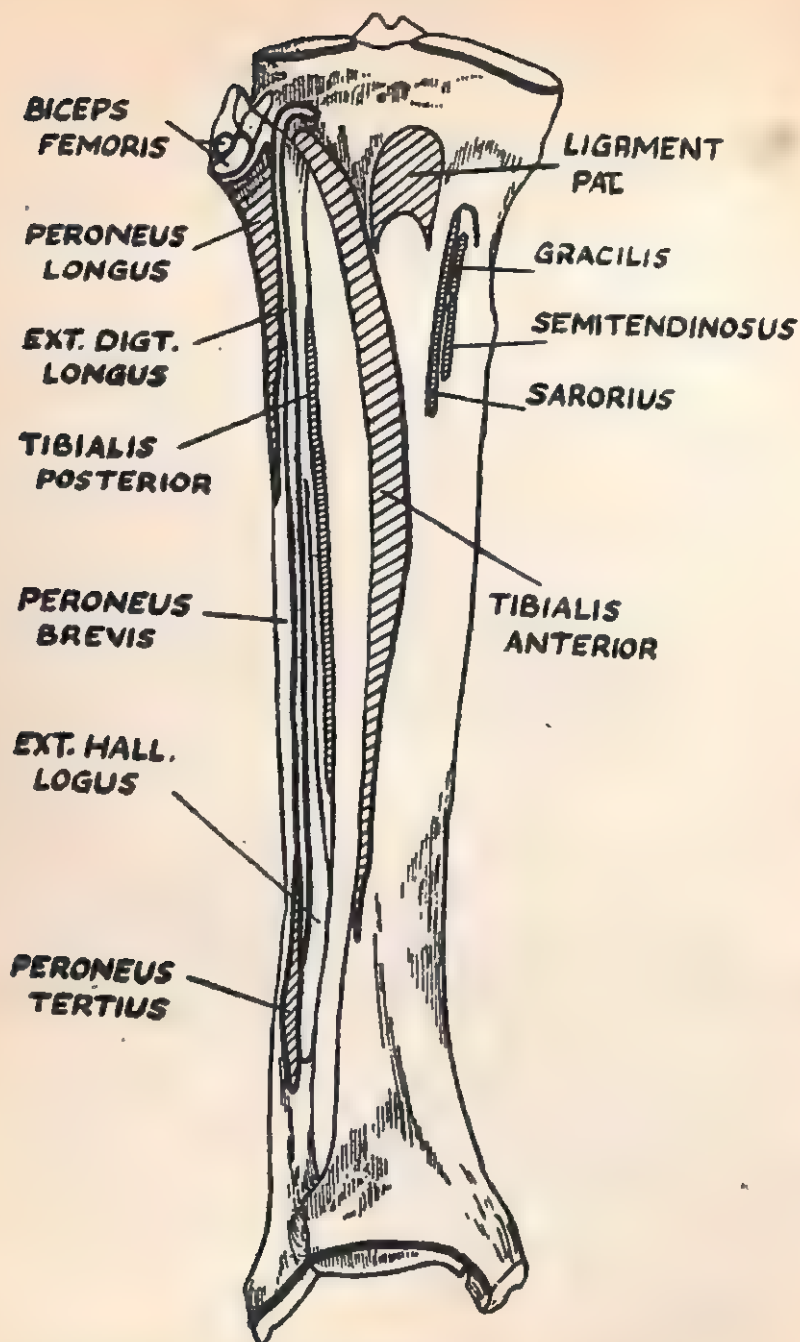


Fig. 48. The bones of the right leg. Anterior aspect.

(ii) Posterior.

(iii) Medial.

(iv) Lateral.

Borders :—

1. **Antero-lateral of anterior border :—**The antero-lateral or anterior border begins above in front of the head of the fibula and runs vertically downwards and a little below the middle of the bone divides into two ridges which run to the lateral malleolus and forming the sides of a triangular subcutaneous surface. This border gives attachment to the anterior fibular intermuscular septum.

2. **Antero-medial border or interosseous crest :—**The antero-medial border or interosseous crest runs parallel and close to the upper $\frac{1}{3}$ rd. of the antero lateral (Anterior) border but diverges from its lower $\frac{2}{3}$ rd. It is situated on the medial side of the antero-lateral (anterior) border. It begins above below the head of the fibula and it ends at the apex of the rough triangular surface which is situated above the articular facet of the lateral malleolus. It gives attachment to the cural interosseous membrane.

3. **Postero-lateral or Posterior border :—**The postero-lateral or posterior border begins above at the styloid process of the head of the fibula and ends below at the posterior border of the lateral malleolus. It gives attachment to the posterior fibular intermuscular septum.

4. **Postero-medial border :—**The postero-medial border is sometimes called the oblique line.

It begins above at the medial side of the head of the fibula and ends at the interosseous crest on the lower part of the bone. It gives attachment to an aponeurosis.

Surfaces

1. **Anterior surface :—**The anterior surface lies between the antero lateral (anterior) border and the antero-medial border (interosseous crest). It gives origin to the extensor digitorum longus, extensor hallucis longus, and peroneus tertius.

2. **Posterior surface** :—The posterior surface lies between the postero-lateral (posterior) border and the postero-medial borders.

It gives origin to the soleus and the flexor hallucis longus.

3. **Medial surface** :—The medial surface lies between the antero-medial and the postero-medial borders. This surface gives origin to the tibialis posterior.

4. **Lateral surface** :—The lateral surface lies between the antero-lateral (anterior) and the postero-lateral (posterior) borders. This surface gives origin to the peroneus longus and peroneus brevis.

TIBIA AND FIBULA

Q. Describe the posterior surface of the body of the tibia and the fibula.

Tibia

Posterior surface of the body of the tibia.

The posterior surface of the body of the tibia lies between the medial border and the interosseous crest. The upper part of the body is crossed by a prominent oblique ridge known as the soleal or oblique or popliteal line. It runs obliquely downwards from the fibular facet to the medial border at the junction of the upper with the middle one-third of the tibia. It gives attachment to the following structures :

- | | |
|-------------------------------|---------------------------------------------|
| (i) Popliteal fascia | } These muscles take origin from this line. |
| (ii) Portions of soleus | |
| (iii) Flexor digitorum longus | |
| (iv) Tibialis posterior | |

Above the oblique line there is triangular space which gives insertion to the popliteus muscle.

Below this line is the orifice of the nutrient canal.

Beginning from the middle of the oblique line the middle one-third of the posterior surface is subdivided by means of a vertical ridge into medial and lateral areas.

The medial area is broad and gives origin to the flexor digitorum longus.

The lateral area is narrow and gives origin to a portion of the tibial posterior.

The lower portion of the posterior surface is smooth and covered by the following muscles :—

(i) *Tibialis posterior.*

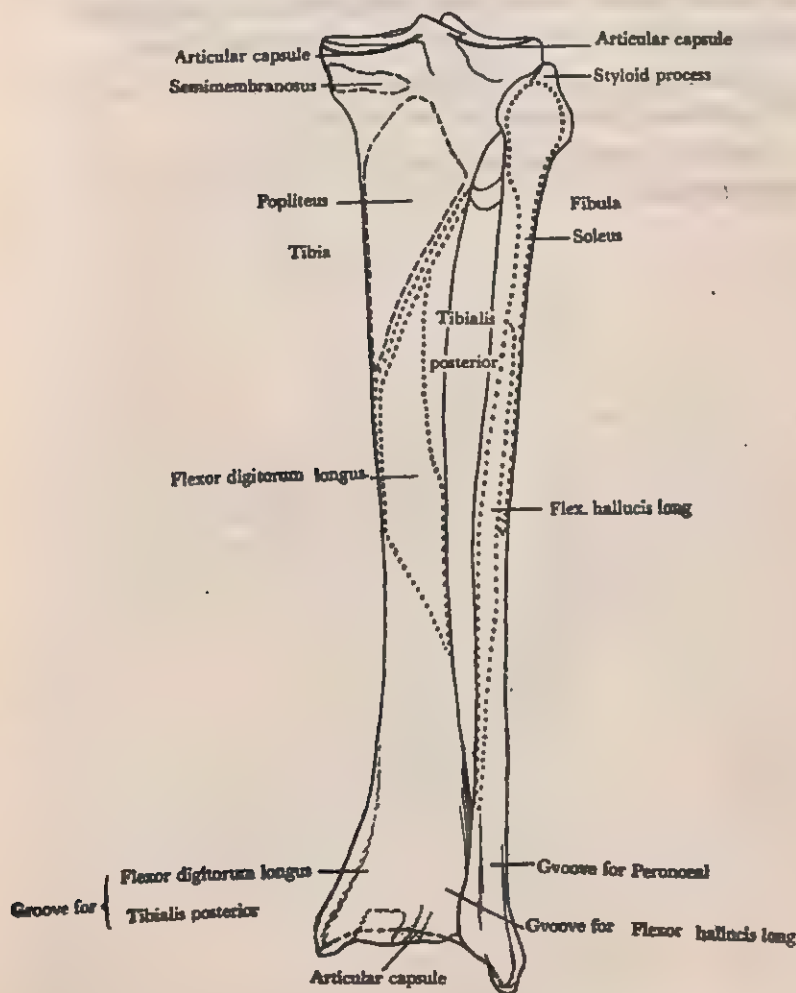


Fig. 49. Posterior aspect of the tibia and fibula.

(ii) Flexor digitorum longus.

(iii) Flexor hallucis longus.

Fibula

Posterior surface of the body of the fibula.

The posterior surface of the body of the fibula lies between the postero-lateral border and the postero-medial border. Its upper one-third is rough and gives origin to the soleus.

The middle portion of the posterior surface gives origin to a small portion of the flexor hallucis longus.

Its lower part articulates with the tibia by means of interosseous ligament.

Q What are the muscles of the iliac region ? Describe them.

The following are the muscles of the iliac region:—

- (i) Psoas major
- (ii) Psoas minor
- (iii) iliacus

Psoas major

Origin

(i) From the anterior surfaces and lower borders of the transverse processes of all the lumbar vertebrae.

(ii) By five digitations from the bodies of two vertebrae with their intervertebral fibro-cartilage.

(iii) From the series of tendinous arches from the bodies of the-fourth and fifth lumbar vertebrae with their fibro-cartilage.

Insertion

The muscle passes downwards and runs behind the inguinal ligament and ends in a tendon which is inserted into the lesser trochanter of the femur.

Nerve supply

By branches from the second and third lumbar nerves.

Actions

Psoas major, acting from above, flexes the thigh upon the pelvis.

Acting from below, with the femur fixed it bends the lumbar vertebrae forward and to its own side.

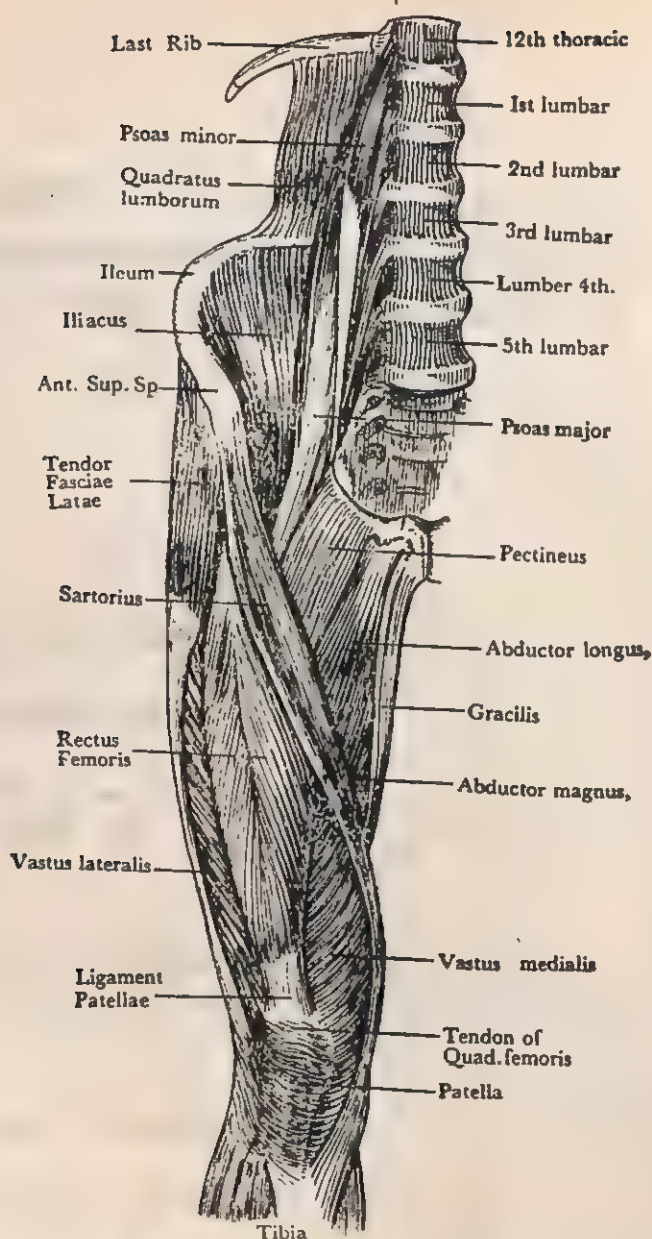


Fig. 50. Muscles of the iliac region and the anterior muscles of the thigh.

Psoas minor**Origin**

- (i) From the sides of the bodies of the twelfth thoracic vertebra and the first lumbar vertebra.
- (ii) From the intervertebral fibro-cartilage between them.

Insertion

- (i) Into the pecten pubis.
- (ii) Into the iliopectineal eminence.

Nerve supply

By a branch from the first lumbar nerve.

Action

It is a tensor of the iliac fascia.

Iliacus**Origin**

- (i) From the upper two-thirds of the iliac fossa.
- (ii) From the inner lip of the iliac crest.
- (iii) From the anterior sacro-iliac and ilio-lumbar ligaments.
- (iv) From the ala of the sacrum.

Insertion

(i) Into the lateral side of the tendon of the psoas major muscle.

(ii) Some fibres are inserted below and in front of the lesser trochanter.

Nerve supply

By branches of the second and third lumbar nerves through the femoral nerve.

Actions

Iliacus with psoas major muscle tilts the pelvis forwards. It also flexes the thigh upon the pelvis when acts with the psoas major muscle from above. When the iliacus and the psoas major of both sides act from below, they maintain the erect

posture by supporting the vertebral column and pelvis upon the femur.

Q. What are the muscles of the anterior region of the thigh ? Describe two of them.

The following are the muscles of the anterior region of the thigh:—

(i) Tensor fascial latae.

(ii) Sartorius.

(iii) Quadriceps femoris

} Rectus femoris.
Vastus lateralis.
Vastus medialis.
Vastus intermedius.

(iv) Articularis genus.

Tensor fascial latae

Origin

(i) From outer lip of the iliac crest.

(ii) From the outer surface of the anterior iliac spine.

(iii) From the outer border of the notch below the anterior superior iliac spine.

(iv) From the deep surface of the fascia lata.

Insertion

It is inserted between the two layers of the ilio-tibial tract of the fascia lata.

Nerve supply

By the fourth and fifth lumbar and first sacral nerves through the superior gluteal nerve.

Actions

It tightens the fascia lata. Acting from below it keeps the pelvis steady on the head of the femur in the erect posture. It abducts and rotates the thigh medially. It helps to flex the hip joint and extends the knee joint.

Rectus femoris

It arises by two heads—an anterior or straight and a posterior or reflected.

Anterior or straight heads

Origin

From the anterior inferior iliac spine.

Posterior or reflected head

Origin

From a groove above the brim of the acetabulum on the gluteal surface of the ilium.

The two heads unite at an acute angle and spread into an aponeurosis.

Insertion

Into the base of the patella.

Nerve supply

By the second, third and fourth lumbar nerves through the femoral nerve.

Actions

The rectus femoris assists the psoas major and iliacus in supporting the pelvis and trunk upon the femur. It also flexes the thigh on the pelvis.

Q. Describe the fascia lata.

The deep fascia of the thigh is known as the fascia lata which is attached to the back of the sacrum and the coccyx. It is attached to the iliac crest laterally. In front it is attached to the inguinal ligament and the superior ramus of the os pubis. It covers the whole of the thigh. It varies in thickness in different parts of the limb. Thus it is thicker in the upper and lateral portions of the thigh as it receives a fibrous expansion from the glutacus maximus. It is also thicker where the tensor fascia latae is inserted between its two layers. It is thinner at the upper and medial portions whereas it covers the adductor muscles. It becomes stronger at the knee because it receives the fibrous expansions from

the biceps femoris laterally, from the sartorius medially and from the quadriceps femoris anteriorly. The portion of the fascia lata, attached to the front of iliac crest and the tensor fascia lata, descends downwards along the lateral side of the thigh in two layers. One layer runs superficially on the tensor fascia lata and the other layer runs behind the tensor fascia lata. These two layers are united at the lower border to the muscle to form a strong band known as the ilio-tibial tract (ilio-tibial band) which is attached to lateral condyle of the tibia. The layers of the ilio-tibial tract, situated behind the tensor fascia latae, is extended upwards and joins the lateral portion of the capsule of hip joint. The most of the portion of the tendon of the gluteus maximus is inserted into the ilio-tibial tract. Below the ilio-tibial tract is attached to the condyles of the femur, the tibia and the head of the fibula. On each side of the patella the ilio-tibial tract is strengthened by the fibres from the lower portions of the vasti muscles.

The fascia latae which is attached to the iliac crest descends over the gluteus medius and splits into two layers at the upper border of the gluteus maximus to enclose the muscle. These two layers reunite against the lower border of the gluteus maximus.

Q. Describe the origin, insertion and nerve supply of the following muscles :—

- (i) Vastus medialis
- (ii) Vastus lateralis
- (iii) Articularis genus

Vastus medialis

Origin

- (i) From the lower one-half of the inter-trochantric line.
- (ii) Medial lip of the linea aspara.
- (iii) Upper part of the medial supra-condylar ridge.
- (iv) From the tendons of the adductor longus and the adductor magnus.
- (v) Medial inter-muscular septum.

Insertion

Into the medial border of the patella,

Nerve supply

Femoral nerve.

Vastus lateralis**Origin**

- (i) From the inter-trochantric line.
- (ii) From the anterior and inferior borders of the greater trochanter.
- (iii) From the lateral lip of the gluteal tuberosity.
- (iv) From the upper one half of the lateral lip of the linea aspara.

Insertion

Into the lateral border of the patella.

Nerve supply

Femoral nerve.

Articularis genus**Origin**

From the anterior surface of the lower part of the body of the femur.

Insertion

Into the upper part of the synovial membrane of the articular capsule of the knee joint.

Nerve supply

Femoral nerve.

Q. What are the muscles of the medial side of the thigh? Describe three of them.

The following are the muscles of the medial side of the thigh :—

- (i) Gracilis.
- (ii) Pectineus.

muscle. It runs obliquely downwards and lateralwards to the fibular side, lying on the tibialis posterior muscle. It then goes along the postero-medial border of the fibula between the tibialis posterior and the flexor hallucis longus or it passes deep to the flexor hallucis longus. A little above the ankle-joint the artery comes out from the deep surface of the flexor hallucis longus and divides into lateral calcaneal branches which supply the lateral and posterior surfaces of the calcaneus.

Branches

The following are the branches of the peroneal artery :—

- (i) Muscular.
- (ii) Nutrient.
- (iii) Perforating.
- (iv) Communicating.
- (v) Lateral calcaneal.

Q. Describe the lateral plantar artery.

The lateral plantar artery is one of the largest terminal branch of the posterior tibial artery. It first runs obliquely and lateralwards to the base of the 5th metatarsal bone with the lateral plantar nerve which lies on its medial side. From the base of the 5th metatarsal bone it turns medially to the interval between the bases of the 1st and 2nd metatarsal bones where it unites with the dorsal pedis artery. It thus forms the plantar arch.

As the artery passes laterally, it at first lies between the calcaneum and the abductor hallucis. It then lies between the flexor digitorum brevis and flexor digitorum accessorius. As it runs to the base of the 5th metatarsal bone, it lies between the flexor digitorum brevis and the abductor digiti minimi and is covered by the plantar aponeurosis, superficial fascia and skin.

Branches

- I. Muscular.
- II. Superficial.
- III. Anastomotic.

The muscular branches supply the adjoining muscles.

Superficial branches supply the skin, subcutaneous tissue of the lateral part of the sole.

The anastomotic branches anastomose with the branches of the lateral tarsal and arcuate arteries.

Q. Describe the Plantar arch.

The plantar arch is formed by the lateral plantar artery with the dorsal pedis artery. The plantar arch extends from the base of the 5th metatarsal bone to the proximal part of the 1st interosseous space where it joins with the dorsal pedis artery and thus completes the palmar arch. It is situated deeply and lies on the bases of the 2nd, 3rd and 4th metatarsal bones and corresponding interosseous muscles and the oblique head of the adductor hallucis. The arch forms a convex shape pointing towards the digits.

Branches

1. Three perforating and four plantar metatarsal branches.
2. Twigs to the skin, the fasciae and the muscles of the sole.

Q. Describe the course, relation and branches of the dorsal pedis artery.

The dorsal pedis artery is the continuation of the anterior tibial artery. It lies midway between two malleoli at the dorsum of the ankle-joint. It runs from the ankle-joint towards the medial side of the dorsum of the foot to the first intermetatarsal space. Here it divides into two branches viz. first dorsal metatarsal and deep plantar arteries.

Relations

It lies anterior to the articular capsule of the ankle-joint, the talus, navicular, and second coniform bones and the ligaments attached to them. The dorsal pedis artery is covered anteriorly by the skin, the superficial fascia and the cruciate crural ligaments.

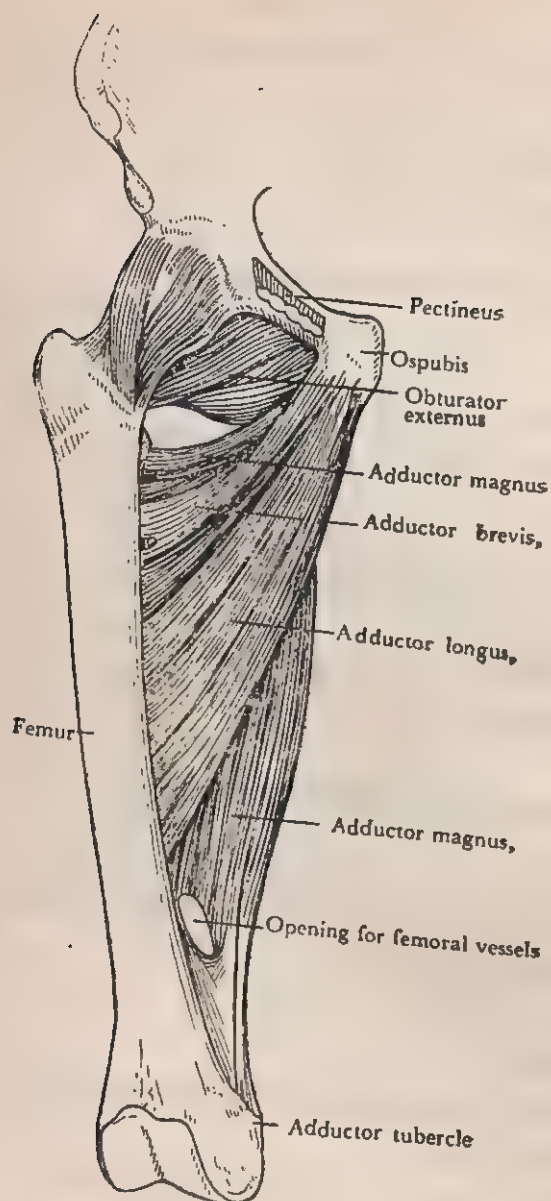


Fig. 51. Muscles of the medial side of the thigh.

- (iii) Adductor longus.
- (iv) Adductor brevis.
- (v) Adductor magnus.

Gracilis

Origin

- (i) From the anterior border of the lower one-half of the symphysis pubis.
- (ii) From the upper one-half of the pubic arch.

Insertion

The fibres descend vertically and end in a tendon which passes behind the medial condyle of the femurs and gets inserted into the upper part of medial surface of the body of the tibia below its medial condyle.

Nerve supply

Obturator nerve.

Actions

- (i) Flexes the leg.
- (ii) Rotates the leg inward.
- (iii) Adducts the thigh.

Pectineus

Origin

- (i) From the pecten pubis.
- (ii) From the surface between the ilio-pectineal eminence and the pubic tubercle.

Insertion

The fibres run downwards, lateralwards and backwards and are inserted into the pectineal line of the femur, running from the lesser trochanter to the linea aspera.

Nerve supply

- (i) Femoral nerve.
- (ii) Accessory obturator nerve (when it is present).
- (iii) A branch from the obturator nerve (when it gives a filament).

Actions

- (i) Adducts the thigh.
- (ii) Flexes the thigh on the pelvis.

Relations**Anterior relation**

- (i) Fascia lata.
- (ii) Femoral vessels.
- (iii) Great saphenous vein.

Posterior relation

- (i) Capsule of the hip joint.
- (ii) Adductor brevis.
- (iii) Obturator externus.
- (iv) Anterior branch of the obturator nerve.

Lateral relation

- (i) Psoas major.
- (ii) Medial femoral circumflex vessels.

Medial relation

Adductor longus.

Adductor brevis**Origin**

- (i) From the outer surface of the inferior ramus of the os pubis between the gracilis and obturator externus muscles.

Insertion

Its fibres run downwards, lateralwards and backwards and are inserted into the linea aspera of the femur between the pectineus and the upper part of the adductor longus.

Nerve supply

Obturator nerve.

Actions

- (i) Adducts the thigh.
- (ii) Flexes the thigh on the pelvis.
- (iii) Rotates the thigh outwards.

Relations**Anterior relation**

- (i) Pectineus.
- (ii) Adductor longus.
- (iii) Profunda femoral artery.
- (iv) Anterior branch of the obturator nerve.

Posterior relation

- (i) Adductor magnus.
- (ii) Posterior branch of the obturator nerve.

Lateral relation

- (i) Medial femoral circumflex artery.
- (ii) Obturator externus
- (iii) Conjoined tendon of the psoas major and iliacus.

Medial relation

- (i) Gracilis.
- (ii) Adductor magnus.

The first or second perforating artery of the arteria profunda femoris pierces the adductor brevis at the insertion point.

Adductor magnus**Origin**

- (i) From the inferior ramus of the os pubis.
- (ii) From the inferior ramus of the ischium.
- (iii) From the lateral margin of the inferior portion of the ischial tuberosity.

Insertions

- (i) Into the linea aspera.
- (ii) Into the adductor tubercle on the medial condyle of the femur.

The adductor magnus is perforated by four small openings which give passage to the perforating branches of the arteria profunda femoris.

The lower opening is the largest one which transmits the femoral vessels to the popliteal fossa.

Nerve supply

- (i) Obturator nerve.
- (ii) A branch from the sacral plexus through the sciatic nerve.

Actions

- (i) Adducts the thigh.
- (ii) Rotates the thigh outwards.
- (iii) Flexes the thigh on the pelvis.

Relations**Anterior relation**

- (i) Pectineus.
- (ii) Adductor brevis and longus.
- (iii) Femoral and profunda vessels.
- (iv) Posterior branch of the obturator nerve.

Posterior relation

- (i) Sciatic nerve.
- (ii) Glutaeus maximus.
- (iii) Biceps femoris.
- (iv) Semi-tendinosus.
- (v) Semi-membranosus.

Upper relation

- (i) *Quadratus femoris*.
- (ii) Superficial branch of the medial femoral circumflex artery.

Medial relation

- (i) *Gracilis*.
- (ii) *Sartorius*.
- (iii) *Fascia lata*.

THE MUSCLES OF THE GLUTEAL REGION

Q. What are the muscles of the gluteal region ? Describe five of them.

The following are the muscles of gluteal region :—

- (i) *Glutaeus maximus*.
- (ii) *Glutaeus medius*.
- (iii) *Glutaeus minimus*.
- (iv) *Piriformis*.
- (v) *Obturator externus*.
- (vi) *Gemellus superior*.
- (vii) *Gemellus inferior*.
- (viii) *Quadratus femoris*.
- (ix) *Obturator internus*.

Glutaeus Maximus**Origin**

- (i) From the posterior gluteal line of the ilium.
- (ii) From the rough portion of the ilium behind the posterior gluteal line including the crest.
- (iii) From the aponeurosis of the *sacro-spinalis*.
- (iv) From the lower portion of the posterior surface of the sacrum and the side of the coccyx.
- (v) From the *sacro tuberos ligament*.

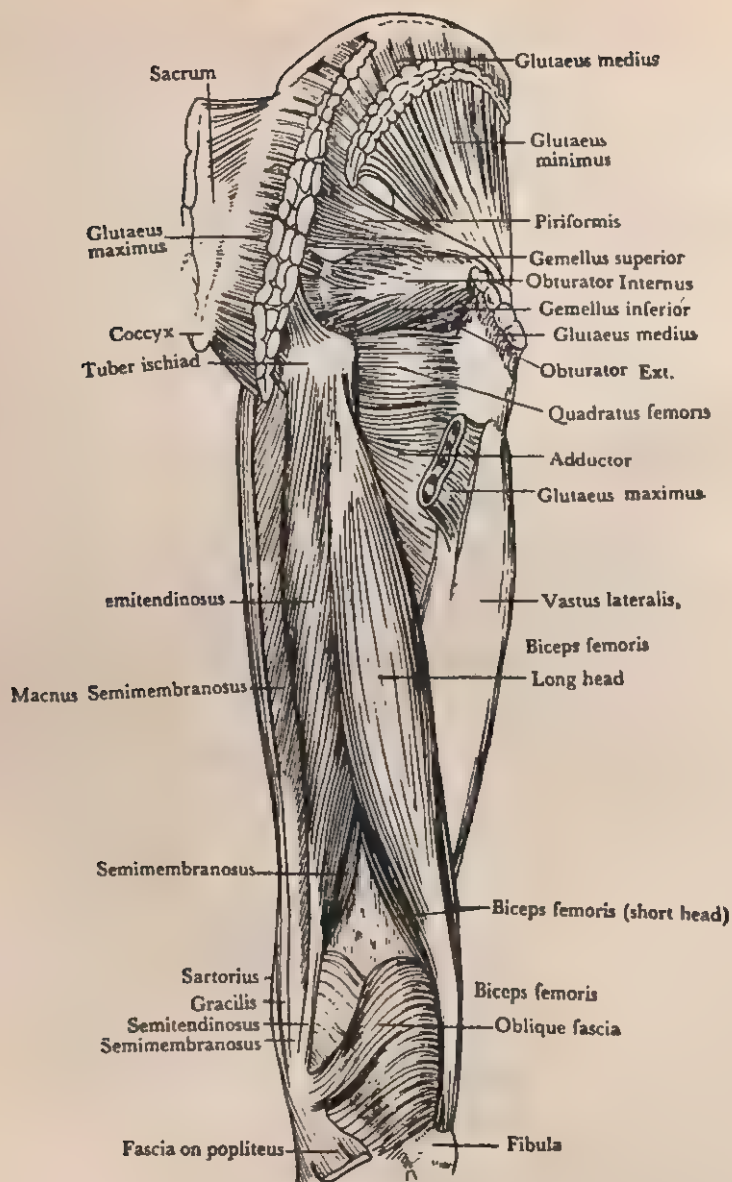


Fig. 52 Posterior muscles of the thigh.

- (vi) From the fascia covering the *glutaeus medius*.

Insertion

- (i) Into the ilio-tibial tract of the fascia lata.
(ii) Into the gluteal tuberosity of the femur between the vastus lateralis and adductor magnus.

Nerve supply

Inferior gluteal nerve.

Actions

It extends the thigh when the *glutaeus maximus* is fixed at the pelvis.

When the *glutaeus maximus* is fixed below, it supports the pelvis and the trunk upon the head of the femur. Its chief action is to raise the trunk by drawing the pelvis backwards after it is bent. It is also a tensor of the fascia lata.

Glutaeus medius

Origin

From the outer surface of the ilium between the iliac crest, the posterior gluteal line and the anterior gluteal line.

Insertion

Into the oblique ridge running downwards and forwards on the lateral surface of the greater trochanter of the femur.

Nerve supply

Superior gluteal nerve.

Actions

- (i) Adducts the thigh.
(ii) Anterior fibres of the muscle rotate the thigh inwards.

Glutaeus minimus

Origin

(i) From the outer surface of the ilium between the anterior gluteal line and the inferior gluteal line.

- (ii) From the border of greater sciatic notch.

Insertion

Into a ridge on the lateral portion of the anterior surface of the greater trochanter of the femur.

Nerve supply

Superior glutaecal nerve

Action

- (i) Abductor of the thigh.
- ii) Anterior fibres of the muscle rotate the thigh inwards.

Piriformis

It is the muscles which is situated partly within the pelvis and partly at the back of the hip joint.

Origin

- (i) From the anterior surface of the sacrum between the anterior sacral foramina and the grooves leading from the foramina.
- (i) From the margin of the greater sciatic foramen\
- (ii) From the anterior surface of the sacro-tuberous ligament.

Insertion

The muscle comes out of the pelvis and passes through the greater sciatic foramen and is inserted into the upper border of the greater trochanter of the femur.

Nerve supply

By twigs from the first and second sacral nerves

Action

It rotates the thigh outwards.

Relation

Within pelvis.

Anterior relation

- (i) Rectum (especially left side).
- (ii) Sacral plexus of nerves.
- (iii) Branches of the hypogastric vessels.

Posterior relation

Sacrum.

Relation

Outside the pelvis.

Anterior relation

Posterior surface of the ischium and capsule of the hip joint.

Posterior relation

Glutaeus maximus,

Upper border

(i) Glutaeus medius.

(ii) Superior glutaeal vessels and nerve.

Lower border

(i) Coccygeus muscle.

(ii) Gamelius superior muscle.

(iii) Inferior glutael and internal pudendal vessels.

(iv) Sciatic nerve.

(v) Posterior femoral cutaneous and pudendal nerves.

(vi) Muscular branches from the sacral plexus.

These structures come to the buttock between the piriformis and the gamelius superior muscles.

Quadratus femoris

It is a quadrilateral muscle. It is situated between the gamellus inferior and the upper portion of the adductor magnus muscles.

Origin

From the upper portion of the external border of the ischial tuberosity.

Insertion

Into the upper portion of the linea quadrata of the femur.

Nerve supply

A branch from the fourth and fifth lumbar and first sacral nerves.

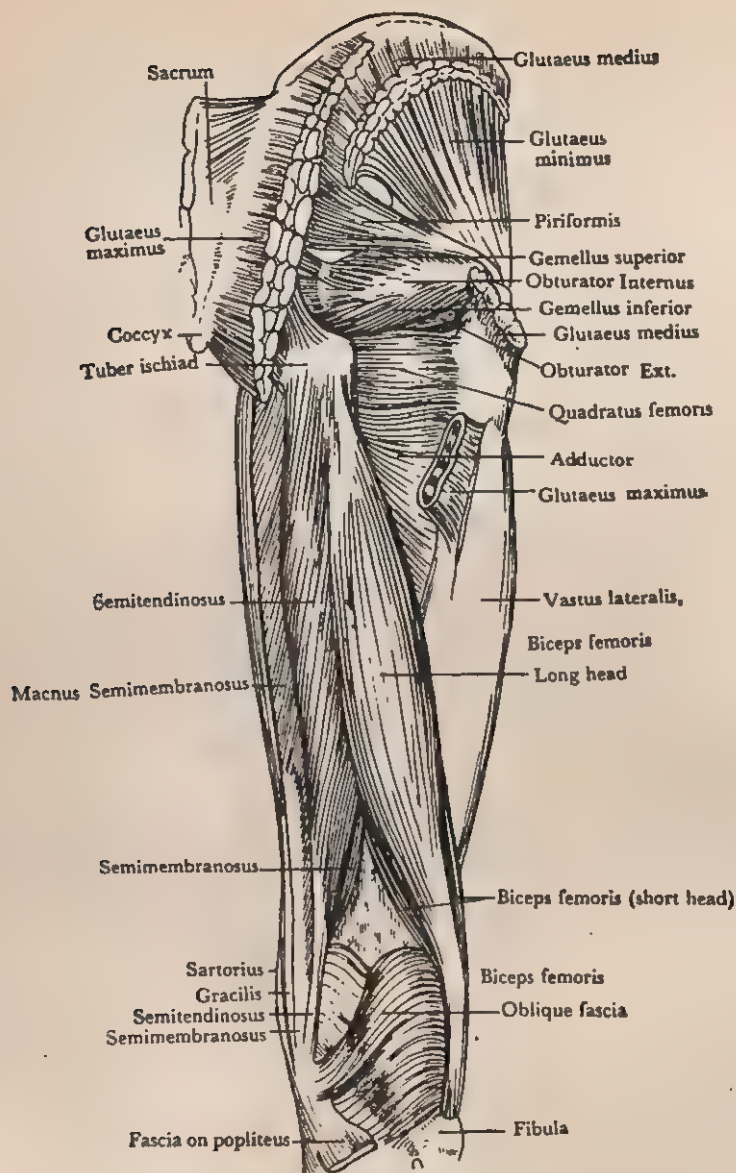


Fig. 53 Posterior muscles of the thigh.

Action

External rotator of the thigh.

Q. What are the posterior muscles of the thigh? Describe the origin, insertion, nerve supply and action of the semi-tendinosus.

The following are the posterior muscles of the thigh :—

- (i) Biceps femoris.
- (ii) Semi-tendinosus.
- (iii) Semi-membranosus.

Semitendinosus**Origin**

From the lower medial impression on the tuberosity of the ischium by a tendon common to it and the longhead of the biceps femoris.

Insertion

The muscle ends in a tendon which curves around the medial condyle of the tibia. It then passes over the tibial collateral ligament of the knee joint and is inserted into the upper portion of the medial surface of the body of the tibia, behind the insertion of the sartorius and below the gracilis muscles.

Nerve supply

Tibial nerve.

Actions

- (i) Flexes the knee when it acts from above.
- (ii) Rotates the leg when the knee joint is semi-flexed inwards.

Q. Describe the origin, insertion, nerve supply and action of the following muscles:—

1. Piriformis.
2. Obturator externus.
3. Quadratus femoris.
4. Biceps femoris.

5. Semi-membranosus.**1. Pyriformis**

Origin :—1. From the anterior surface of the sacrum:—

2. From the margin of the ilium, near the posterior inferior iliac spine.

3. From the deep surface of the sacro-tuberous ligament.

Insertion:—Into the superior borders of the greater trochanter.

Nerve Supply:—By twigs from 1st and 2nd sacral nerves.

Action:—It rotates the thigh outwards.

2. Obturator externus

Origin:—(1) From the external surface of the inferior ramus of the os pubis and ischium round the obturator foramen.

(2) From the obturator membrane.

Insertion:—Into the trochanteric fossa of the greater trochanter.

Nerve Supply:—Obturator nerve.

Action:—External rotator of the thigh.

3. Quadratus femoris

Origin:—From the upper part of the external border of the tuberosity of the ischium.

Insertion:—Into the upper part of the linea quadrata of the femur.

Nerve Supply:—By a branch from the 4th and 5th lumbar and 1st sacral nerve.

Action:—It is an external rotator of the thigh.

4. Biceps femoris

It has two heads of origin—The long head and the short head.

1. Long head of the biceps femoris

Origin:—(1) From the lower and medial surface on the posterior part of the ischial tuberosity.

(2) From the sacro-tuberous ligament.

2. Short head of the biceps femoris**Origin**

Origin:—(1) From the lateral lip of the linea aspera of the femur between the adductor magnus and the vastus lateralis.

2. From the lateral inter-muscular septum.

Insertion:—Two heads join together and are inserted into (1) the lateral side of the head of the fibula.

(2) Into the lateral condyle of the tibia by a small slip.

Nerve Supply:—The long head is supplied by the medial popliteal nerve and the short head is supplied by the lateral popliteal nerve.

5. Semi-membranous

Origin:—From the upper and lateral surface of the ischial tuberosity.

Insertion:—Into the groove on the back of the medial condyle of the tibia.

Nerve Supply:—By the medial popliteal nerve.

Actions:—The muscle extends the hip joint when it tract from above. It also flexes the leg upon the thigh. Acting from below it extends the trunk upon the thigh.

Q. What are the muscles of the anterior region of the thigh? Describe one of them.

The following are muscles of the anterior region of the thigh:—

1. Tensor fasciae latae
2. Sartorius.
3. Quadriceps femoris.

- | | |
|---|-------------------------|
| { | 1. Rectus femoris. |
| | 2. Vastus lateralis. |
| | 3. Vastus medialis. |
| | 4. Vastus inter medius. |

4. Articularis genus.

Sartorius:—It is a ribbon-shaped muscle.

Origin

1. From the anterior superior iliac spine.
2. From the upper part of the notch below the spine.

Insertion

Into the upper part of the medial surface of the body of the tibia, in front of the gracilis and semi-tendinous.

Nerve supply

Femoral nerve.

Action

It flexes the leg on the thigh and the thigh on the pelvis. It also abducts the thigh. It flexes the pelvis on the thigh when it is acting from below.

Q. What are the muscles of the medial side of the thigh ? Describe one of them and its relation.

The following are the muscles of the medial side of the thigh:—

1. Gracilis.
2. Pectineus.
3. Adductor longus.
4. Adductor brevis.
5. Adductor magnus.

Adductor longus:—

Origin

1. From the femoral surface of the body of the os pubis near the symphysis pubis.
2. Below the pubic crest.

Insertion

Into the medial lip of the linea aspera between the vastus medialis and the adductor magnus.

Nerve supply

By the anterior or superficial division of the obturator nerve.

Action

Adducts the thigh.

Relations**Anterior**

1. Sartorius.
2. Femoral vessels near its insertion.

Posterior

1. Adductor brevis.
2. Anterior or superficial division of the obturator nerve.
3. Adductor magnus.
4. Profunda femoris vessels.

Lateral relation

1. Pectineus.

Medial relation

1. Gracillis.

Q. What are the muscles of the deep group of the back of the leg ? Describe one of them.

The following are the muscles of the deep group of the back of the leg :—

1. Popliteus.
2. Flexor hallucis longus.
3. Flexor digitorum longus.
4. Tibialis posterior.

Flexor Hallucis longus.

Origin

1. From the lower 2/3rd of the posterior surface of the shaft of the fibula.

2. From the posterior surface of the interosseus membrane.
3. From the crural inter-muscular septum.

The muscle passes obliquely downwards and crosses the posterior surface of the lower end of the tibia, talus, sustentaculum tali of the calcaneum. It then enters the sole of the foot passing between the two heads of the flexor hallucis brevis and is inserted into the base of the distal phalynx of the great toe.

Nerve supply

By the posterior tibial nerve.

Action

It flexes the phalynx of the great toe.

Q. What are the everter muscles of the foot ? Name them and describe one of them.

The following are the everter muscles of the foot :—

1. Peroneus tertitus.
2. Peroneus longus.
3. Peroneus brevis.

Peroneus longus

Origin

1. The anterior aspect of the head of the fibula.
2. From the upper portion of the lateral surface of the body of the fibula.
3. From the anterior and the posterior inter-muscular septum.
4. From the lateral condyle of the tibia.

Insertion

It is inserted by two slips into (a) the lateral side of the base of the 1st metatarsal bone and (b) the lateral side of the 1st cuneiform bone.

Occasionally, a third slip is inserted to the base of the 2nd metatarsal bone.

Nerve supply

The musculo-cutaneous nerve.

Action

It everts the foot by raising its fibular border.

Q. Name the muscles which act as dorsiflexors of the foot.

Describe one of them, its origin, insertion and nerve supply.

The following muscles are the chief dorsiflexors of the foot :—

1. Tibialis anterior.
2. Extensor digitorum longus.
3. Peroneus tertius.

The extensor hallucis longus is the partial dorsiflexor of the foot.

Tibialis Anterior

It is situated on the lateral side of the tibia.

Origin

1. From the lateral condyle of the tibia.
2. From the upper $1/2$ of the lateral surface of the body of the tibia.
3. From the interosseus membrane.
4. From the intermuscular septum.

Insertion

1. Into the medial and undersurface of the 1st cuneiform bone.
2. Into the base of the 1st metatarsal bone.

Nerve supply

Anterior tibial nerve.

Q. Describe the Femoral Sheath.

The femoral sheath is formed by the transversalis fascia and ilio-pectineal fascia which are prolonged downwards behind the inguinal ligament. The transversalis fascia passes in front of

the femoral vessels and the ilio-pectineal fascia passes behind the vessels. It looks like a funnel-shaped. The base is situated upwards and the apex looks downwards. The lateral wall of the femoral sheath is vertical and is perforated by the femoral branch of the genitofemoral nerve.

The medial wall is pierced by the long saphenous vein and some lymphatic vessels. It is divided into three compartments, lateral, intermediate and medial.

The lateral compartment contains the femoral artery.

The intermediate compartment contains the femoral vein.

The medial compartment is small and is known as the femoral canal and contains some lymph glands and vessels.

Q. Describe the femoral canal.

The femoral canal is the medial compartment of the femoral sheath. It is about $1\frac{1}{2}$ cm. long. Its base is pointing upwards and is known as the femoral ring which is oval in shape. The femoral ring is bounded by the inguinal ligament in front, the pectineus and its fascia behind. Medially it is bounded by the pectineal part of the inguinal ligament and laterally by the femoral vein. The spermatic cord in the male and the round ligament of the uterus in the female lie above the ring, while the inferior epigastric vessels are close to the junctions of the anterior and lateral boundries.

Q. Describe the femoral triangle.

The femoral triangle is situated on the upper part of the anterior surface of the thigh. The base is formed by the inguinal ligament and is directed upwards. The apex is directed downwards. The lateral side is formed by the medial margin of the sartorius.

The medial side is formed by the medial margin of the adductor longus.

The floor is formed from the lateral to the medial side by the iliacus, the psoas major, pectineus and the adductor longus.

The femoral vessels lie in middle and extend from the base to the apex.

The femoral nerve lies on the lateral side of the femoral artery. The femoral vein lies on the medial side of the artery. It also contains some fat and lymph glands.

Q. Describe the boundaries of the subsartorial canal or adductor canal or Hunter's canal. Name the contents.

(Agra University, G. H. M. S., 1965)

The subsartorial canal is an aponeurotic tunnel situated in the middle 1/3rd of the thigh. It extends from the apex of the femoral triangle to the opening in the adductor magnus. The femoral vessels pass through the canal to the popliteal fossa. It is bounded in front and laterally by the vastus medialis, behind by the adductor longus above and the adductor magnus below. The roof is formed by an aponeurosis which extends from these muscles over the femoral vessels to the vastus medialis. The sartorius lies on the roof.

Contents

The canal contains the femoral artery and the femoral vein and the saphanous nerve.

The saphanous nerve at first lies on the lateral side of the artery. It then lies in front of the artery. Below it lies on the medial side of the artery.

The femoral vein lies at first medial and then posterior to the femoral artery in its upper part and then it lies lateral to the femoral artery in its lower part.

Q. Describe the anterior tibial artery. Give its relations and branches.

(Agra University, G. H. M. S., 1964, Lucknow University, 1962)

The anterior tibial artery is one of the two terminal branches of the popliteal artery. It begins at the lower border of the popliteus muscle and ends at the ankle midway between the two malleolis where it forms the dorsal pedis artery.

It lies on the posterior side of the leg at its commencement. It then passes anteriorly between the two heads of the *tibialis posterior* and lies on the anterior surface of the leg. At first it lies on the anterior surface of the *interosseus* membrane up to the middle of the leg. At the lower part of the leg it lies on the *tibia* and then on the front of the ankle joint between the two *malleoli*.

Relations

In the upper part the anterior tibial artery lies upon the *crural interosseus* membrane. In the upper one-third of its course it lies between the *tibialis anterior* and the *extensor digitorum longus*. In the middle 1/3rd of its course, it lies between the *tibialis anterior* and the *extensor hallucis longus*.

At the ankle the artery is crossed from the lateral to the medial side by the *extensor hallucis longus*. It then lies between the *extensor hallucis longus* and the first tendon of the *extensor digitorum longus*.

The upper 2/3rd of the artery is covered by the muscles which lie on either side of the artery. The lower 1/3rd of the artery is superficial and is covered by the skin, the fascia and the *cruciate crural ligament*.

Q. Describe the popliteal fossa.

The popliteal fossa is situated at the back of the knee. It is diamond shaped. It is bounded above on the lateral side by the *biceps femoris* and below by the lateral head of the *gastrocnemius* and *plantaris*. Medially, it is bounded above by the *semi-membranous* and *semi-tendinosus* and below by the medial head of *gastrocnemius*.

The floor is formed by the popliteal surface of the *femur*, the back of the upper end of the *tibia* and the fascia covering the *popliteus* muscle. The fossa is covered by the popliteal fascia.

Contents

It contains the popliteal vessels, the medial and lateral popliteal nerves, the terminal part of the short saphenous vein,

the lower part of the posterior femoral cutaneous nerve, the articular branch from the obturator nerve and the lymph glands and fat.

The medial popliteal nerve lies in the middle of the fossa and then crosses the vessel posteriorly and lies on the medial side.

The lateral popliteal nerve lies on the lateral side of the artery close to the tendon of the biceps femoris.

The popliteal artery lies in the centre of the floor of the fossa whereas the popliteal vein lies superficial to the artery. At first the vein lies lateral to the artery above. It then crosses the artery posteriorly and comes to the medial side of the artery below.

DEEP RELATION OF THE GLUTEUS MAXIMUS MUSCLE

Q. What are the deep relation of the gluteus maximus?

The gluteus maximus is the muscle of the buttock. The deep relation is as follows :—

1. Dorsal surface of the sacrum and coccyx.
2. Posterior part of the ilium.
3. Ischial tuberosity.
4. Posterior part of the greater trochanter.
5. Upper part of the shaft of the femur.
6. Posterior sacro-iliac ligament.
7. Sacro-tuberous ligament.
8. Sacro-spinous ligament.
9. Gluteus medius.
10. Piriformis.
11. Obturator internus.
12. Two gemelli.
13. Quadratus femoris.
14. Proximal part of the adductor magnus muscle.
15. Vastus lateralis.

16. Proximal attachment of the hamstrings.
17. Superior gluteal vessels and nerve.
18. Sciatic nerve.
19. Posterior cutaneous nerve of the thigh.
20. Inferior gluteal vessels and nerve.
21. Internal pudendal vessels and nerve.
2. Nerves to the quadratus femoris and obturator internus.
23. Transverse branch of the medial circumflex artery.

Q. What are the anterior muscles of the leg ? Describe the origin, insertion, nerve supply and action of the two muscles.

The following are muscles of the anterior region of the leg :—

- (i) Tibialis anterior.
- (ii) Extensor hallucis longus.
- (iii) Extensor digitorum longus.
- (iv) Peronaeus tertius.

Tibialis anterior

Origin

- (i) From the lateral condyle of the tibia.
- (ii) From the upper two-thirds of the lateral surface of the body of the tibia.
- (iii) From the interosseous membrane.
- (iv) From the intermuscular septum.

Insertion

The muscle ends in a tendon which passes through the medial compartments of the transverse and cruciate crural ligaments. It then runs on the medial side of the foot and is inserted into the medial and under surface of the first cuneiform bone and the base of the first metatarsal bone.

The tibialis anterior muscle covers the anterior tibial vessels and the deep peroneal nerve in the upper portion of the leg.

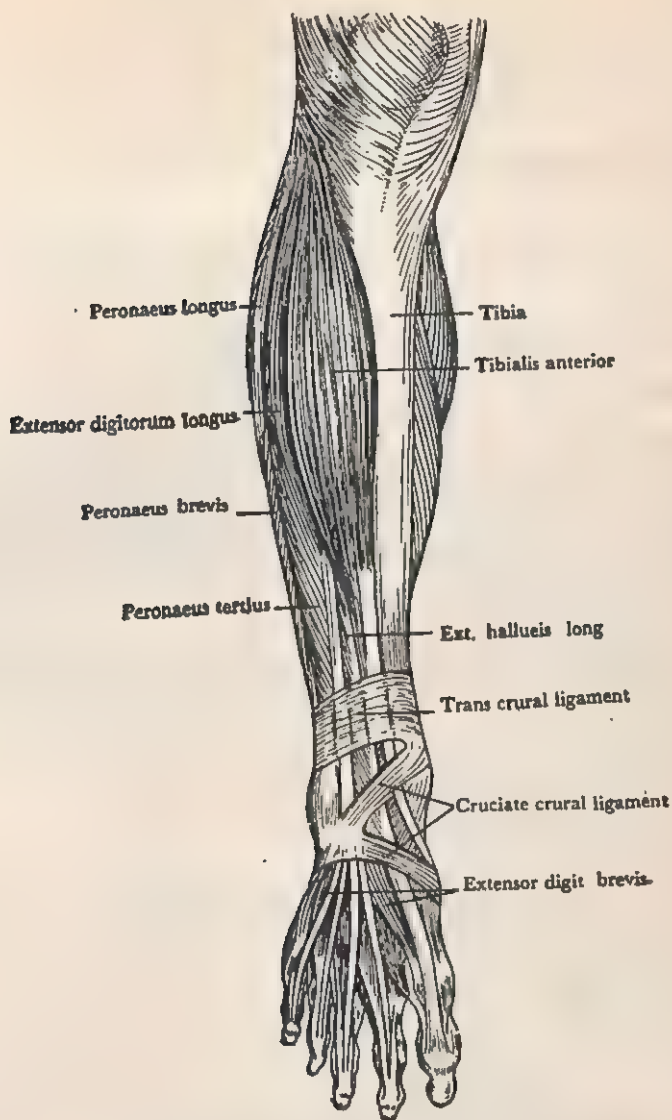


Fig. 54. Anterior muscles of the leg.

Nerve supply

Deep peroneal nerve.

Actions

- (i) Flexes the ankle joint.
- (ii) Raises the medial border of the foot (*i. e.* inverts the foot).

Extensor hallucis longus**Origin**

(i) From the middle two-fourths of the anterior surface of the fibula.

(ii) From the interosseous membrane.

Insertion

The muscle ends in a tendon which passes through the medial compartments of the transverse and cruciate crural ligaments. It then crosses the anterior tibial vessels near the ankle joint and runs on the medial side. It is inserted into the base of the distal phalanx of the great toe.

The anterior tibial vessels and the deep peroneal nerve are situated between the extensor hallucis longus and the tibialis anterior.

Nerve supply

Deep peroneal nerve.

Actions

(i) Extends the phalanges of the great toe and flexes the ankle joint.

(ii) Dorsiflexor of the foot.

Peroneus tertius**Origin**

(i) From the lower one-third of the anterior surface of the fibula.

(ii) From the lower portion of the interosseous membrane.

(iii) Anterior fibula inter-muscular septum.

Insertion

The muscle ends in a tendon and passes behind the transverse and cruciate crural ligaments in the same compartment of the extensor digitorum longus. It is inserted into the dorsal surface of the base of the fifth metatarsal bone.

Nerve supply

Deep peroneal nerve.

Actions

- (i) Flexes the ankle joint.
- (ii) Raises the lateral border of the foot (*i. e.* everts the foot).
- (iii) Dorsiflexor of the foot.

Q. What are the muscles of the deep group of the posterior surface of the leg? Describe three of them.

The following are the deep group of the posterior surface of the leg :—

- (i) Popliteus.
- (ii) Flexor hallucis longus.
- (iii) Flexor digitorum longus.
- (iv) Tibialis posterior.

Popliteus**Origin**

- (i) From a depression at the anterior portion of the groove on the lateral condyle of the femur by a tendon.
- (ii) From the oblique popliteal ligament of the knee-joint.

Insertion

In the medial two-thirds of the triangular space above the popliteal line situated on the posterior surface of the upper part of the body of the tibia.

Nerve supply

Tibial nerve.

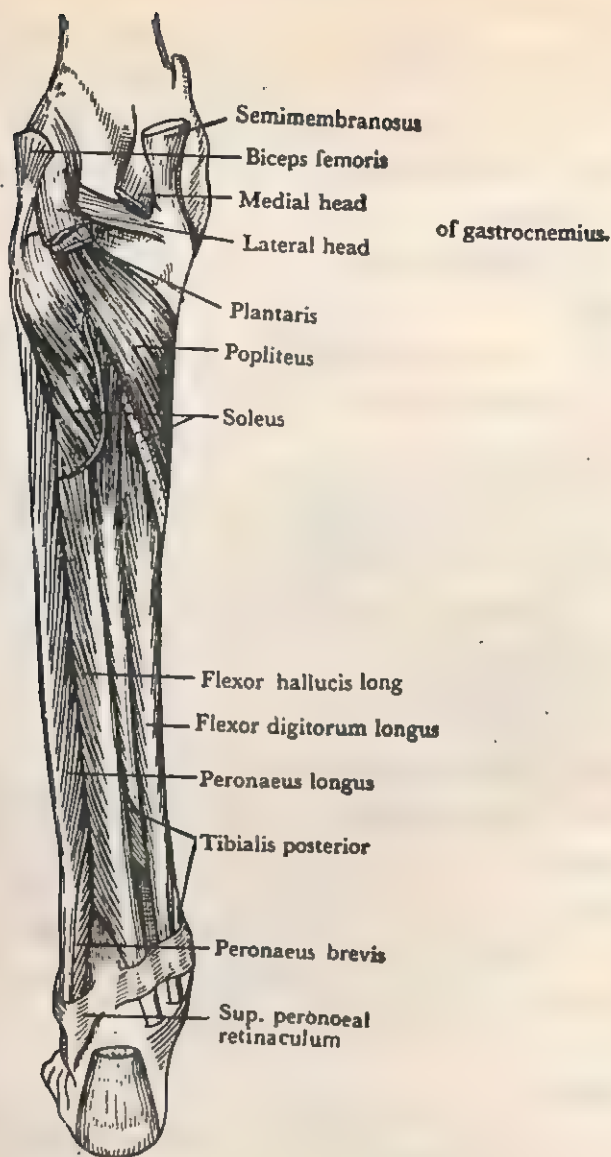


Fig. 55: Posterior muscles of the leg (Deep group)

Actions

- (i) Flexes the knee-joint.
- (ii) Rotates the tibia inwards after the knee-joint is flexed.

Flexor hallucis longus**Origin**

- (i) From the inferior two-thirds of the posterior surface of the body of the fibula.
- (ii) From the lower portion of the interosseous membrane.
- (iii) From the fascia covering the tibialis posterior.

Insertion

The muscle ends in a tendon which passes obliquely downwards and backwards. It crosses the posterior surface of the lower end of the tibia, the talus and the under-surface of the sustentaculum tali of the calcaneus. It then passes between the two heads of the flexor hallucis brevis in the sole of the foot and is inserted into the base of the distal phalanx of the great toe.

Nerve supply

Tibial nerve.

Actions

- (i) Flexes the great toe.
- (ii) Extends the ankle joint.

Relations**Anterior relation**

- (i) Soleus.
- (ii) Tendo-calcaneus.

Posterior relation

- (i) Fibula.
- (ii) Tibialis posterior.
- (iii) Peroneal vessels.

(iv) Lower portion of the interosseous membrane.

(v) Ankle joint.

Lateral relation

Peronei muscles.

Medial relation

(i) Tibialis posterior.

(ii) Posterior tibial vessels and tibial nerve.

Tibialis posterior

It is situated between the flexor hallucis longus and the flexor digitorum longus.

Origin

(i) From the posterior surface of the interosseous membrane of the leg.

(ii) From the lateral part of the posterior surface of the body of the tibia.

(iii) From the upper two-thirds of the medial surface of the fibula.

(iv) From the inter-muscular septum.

Insertion

The muscle ends in a tendon which crosses in front of the flexor digitorum longus and lies in a groove behind the medial malleolus with the flexor digitorum longus in a separate sheath. It then enters the sole of the foot and passes under the lacinate ligament and above the deltoid ligament and is inserted into the tuberosity of the navicular bone.

Nerve supply

Tibial nerve

Actions

(i) Extends the ankle joint.

(ii) Turns the medial border of foot (i. e. inverts the foot).

Relations**Anterior relation**

- (i) Soleus.
- (ii) Flexor digitorum longus.
- (iii) Posterior tibial vessels and tibial nerve.
- (iv) Peronacal vessels.

Posterior relation

- (i) Interosseous membrane.
- (ii) Tibia.
- (iii) Fibula.
- (iv) Ankle joint.

Q. Mention the names of the muscles of the lateral side of the leg Describe them.

The following are the muscles of the lateral side of the leg:—

- (i) Peronaeus longus.
- (ii) Peronaeus brevis.

Peronaeus Longus**Origin**

- (i) From the head of the fibula.
- (ii) From the upper two-thirds of the lateral surface of the body of the fibula.
- (iii) From the anterior and posterior fibular intermuscular septa.
- (iv) From the lateral condyle of the tibia sometimes.

Insertion

The muscle ends in a tendon which passes behind the lateral malleolus. It then passes obliquely forwards across the lateral side of the calcaneus and cuboid bones. Next it crosses the sole of the foot running to the medial side and is inserted by two slips—the one into the lateral side of the base of the first metatarsal bone and the other into the lateral side of the first cuneiform bone.

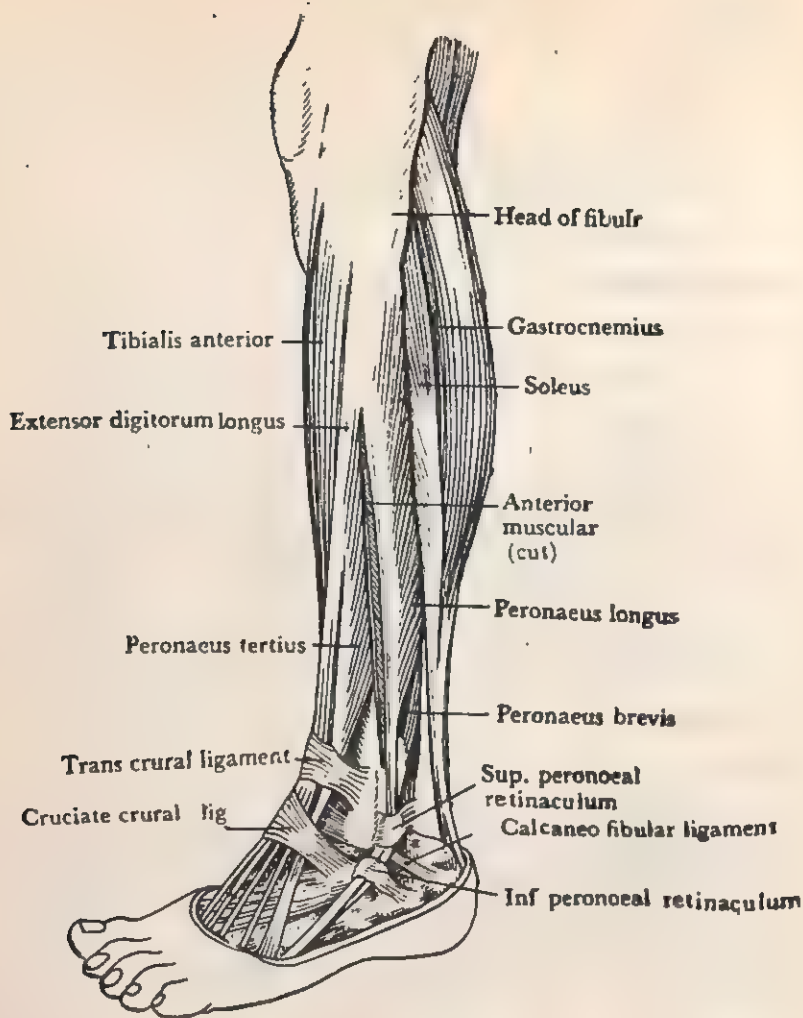


Fig. 56. Muscles of the lateral side of the leg.

Nerve supply

Superficial peroneal nerve.

Actions

- (i) Extends the ankle joint.
- (ii) Everts the foot.

(iii) Steadies the leg on the foot when it acts from below especially standing on one leg.

Peroneus brevis

Origin

(i) From the lower two-thirds of the lateral surface of the body of the fibula.

(ii) From the anterior and posterior fibular inter-muscular septa.

Insertion

The muscle ends in a tendon which passes behind the lateral malleolus and lateral to the calcaneus and is inserted into the lateral side of the tuberosity of the base of the fifth metatarsal bone.

Nerve supply

Superficial peroneal nerve.

Actions

Extends the foot upon the leg.

MUSCLES OF THE FOOT

Q. Name the muscle of the dorsum of the foot. Describe its origin, insertion, nerve supply and action.

The muscle of the dorsum of the foot is the extensor digitorum brevis.

Extensor digitorum brevis

Origin

(i) From the upper and lateral surfaces of the calcaneus.

(ii) From the talo-calcaneal ligament.

(iii) From the cruciate ligament.

Insertion

The muscle ends in four tendons. The first tendon is inserted into the dorsal surface of the base of the first phalanx of the great toe and crosses the dorsal pedis artery.

The other three tendons are inserted into the lateral side of the tendons of the second, third and fourth extensor digitorum longus.

Q. Mention the first layer of the planter muscle of the foot. Describe briefly.

The following are the first layer of the plantar muscles of the foot:—

- (i) Abductor hallucis.
- (ii) Flexor digitorum brevis.
- (iii) Abductor digit quinti.

Abductor hallucis

Origin

- (i) From the medial process of the tuberosity of the calcaneus.
- (ii) From the lacinate ligament.
- (iii) From the plantar aponeurosis.
- (iv) From the inter-muscular septum.

Insertion

Into the medial side of the base of the first phalanx of the great toe.

Nerve supply

Medial plantar nerve.

Actions

- (i) Flexes the proximal phalanx of the great toe.
- (ii) Draws the great toe medialwards.

Flexor digitorum brevis

Origin

- (i) From the medial process of the tuberosity of the calcaneus.
- (ii) From the middle portion of the plantar aponeurosis.
- (iii) From the inter-muscular septum.

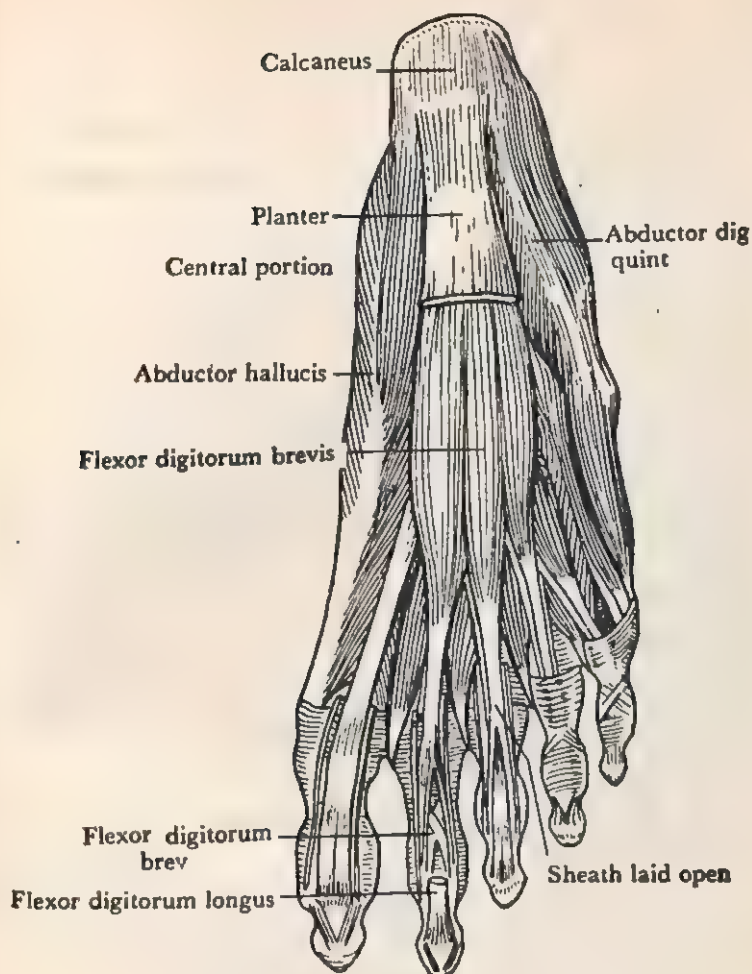


Fig. 57. Planter muscles of the foot. (First layer)

Insertion

The muscle of four lesser toes ends in four tendons. Opposite the bases of the first phalanx, each tendon divides into two slips and allows to pass the corresponding tendon of the flexor digitorum longus. Then the two slips reunite. The tendon again divides and is inserted into the middle portion of the sides of thesecond phalanx of the lesser toes.

Nerve supply

Medial plantar nerve.

Actions

- (i) Flexes the second phalanges upon the first phalanges.
- (ii) Flexes the first phalanges and brings the toes together.

Abductor digit quinti**Origin**

- (i) From the lateral and the medial processes of the tuberosity of the calcaneus.
- (ii) From the plantar aponeurosis.
- (ii) From the inter-muscular septum.

Insertion

Into the lateral side of the base of the first phalanx of the fifth toe.

Nerve supply

Lateral plantar nerve.

Actions

- (i) Flexes the proximal phalanx of the little toe.
- (ii) Draws the little toe lateralwards.

Q. Mention the second layer of the plantar muscles of the foot. Describe them.

The following are the muscles of the second layer of the plantar of the foot:—

- (i) Quadratus plantae (Flexor accessorius)
- (ii) Lumbricales.

Quadratus plantae (Flexor accessorius).

It has two heads of origin, medial and lateral.

Origin**Medial head of origin**

From the medial concave surface of the calcaneus.

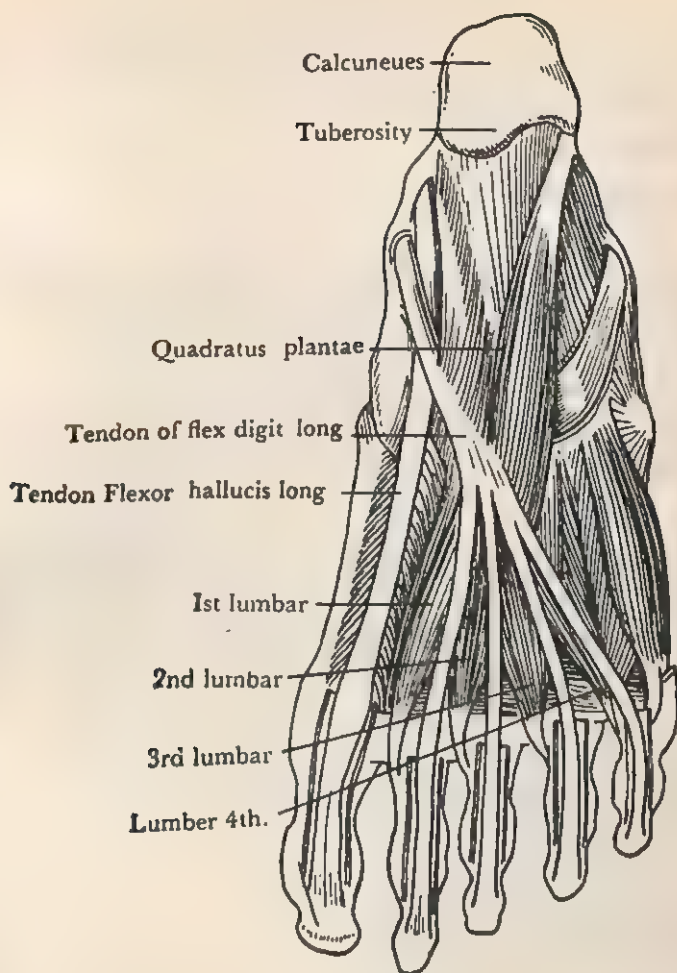


Fig. 58. Planter muscles of the foot (Second layer).

Lateral head of origin

(i) From the plantar aspect of the calcaneus in front of the lateral process of its tuberosity.

(ii) From the long plantar ligament.

Insertion

The two heads join together and form a flat band which is inserted into the inferior surface and the lateral margin of the tendon of the flexor digitorum longus.

Nerve supply

Lateral plantar nerve.

Action

Helps the flexor digitorum longus and turns the oblique pull of the flexor digitorum longus into a direct backward pull on the toes.

Lumbricales

They are four small muscles and can be counted from the medial side of the foot.

Origin

They all arise from the tendons of the flexor digitorum longus except the first lumbricale which takes its origin from the medial border of the first tendon of the flexor digitorum longus.

Insertion

The muscles end in tendons and pass on the medial side of the four lesser toes and are inserted into the tendon of the extensor digitorum longus on the dorsal surface of the first phalanx.

Nerve supply

Medial plantar nerve

Actions

- (i) Flexes the proximal phalanges.
- (ii) Extends the middle and terminal phalanges as they are inserted into the tendons of the extensor digitorum longus.

Q. What are the muscles of the third layer of the plantar of the foot? Describe them.

The following are the muscles of the third layer of the plantar of the foot:—

- (i) Flexor hallucis brevis.
- (ii) Adductor hallucis.
- (iii) Flexor digiti quinti brevis.

Flexor hallucis brevis

Origin

- (i) From the medial portion of the under-surface of the cuboid bone.

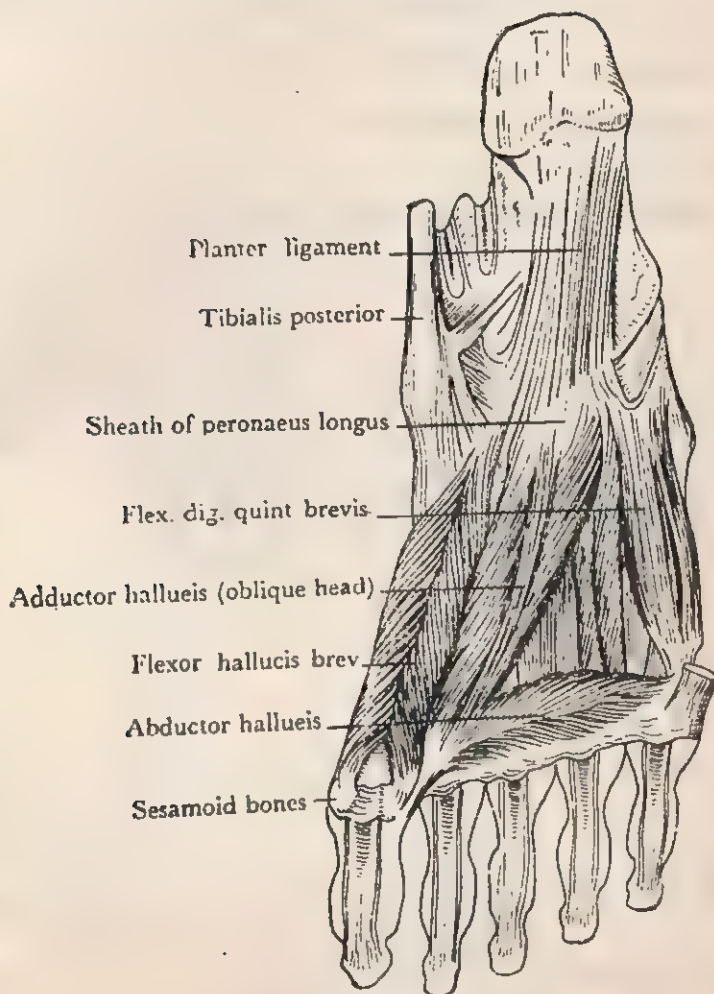


Fig. 59. *Plantar muscles of the foot. (Third layer)*

(ii) From the third cuniciform bone.

(iii) From the tendon of the tibialis posterior.

Insertion

Divides into medial and lateral portions. They are inserted into the corresponding sides of the base of the first phalanx of the great toe.

The medial portion blends with the abductor hallucis and the lateral portion blends with the adductor hallucis at its insertion.

Nerve supply

Medial plantar nerve.

Action

Flexes the proximal phalanx of the great toe.

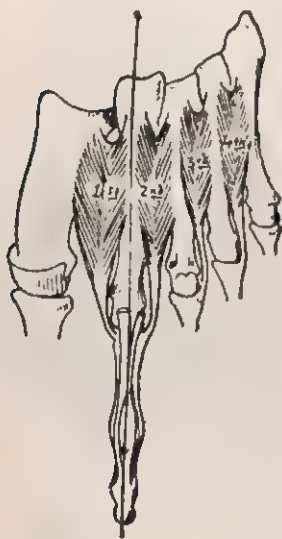


Fig. 60. Dorsal interossei muscles.



Fig. 61. Plantar interossei muscles

Adductor hallucis

It has two heads—oblique and transverse.

Origin of oblique head

- (i) From the bases of the second, third and fourth metatarsal bones.
- (ii) From the sheath of the tendon of the peronaeus longus.

Insertion

Into the base of the first phalanx of the great toe.

Origin of transverse head

- (i) From the plantar metatarso-phalangeal ligaments of the third, fourth and fifth toes.
- (ii) From the transverse metatarsal ligament.

Insertion

Into the lateral side of the base of the first phalanx of the great toe.

Nerve supply

Lateral plantar nerve.

Actions

- (i) Oblique head adducts the great toe and flexes the great toe
- (ii) Transverse head approximates the toes and thus increases the curvature of the transverse arch of the metatarsus.

Flexor digiti quinti brevis**Origin**

- (i) From the base of the fifth metatarsal bone.
- (ii) From the sheath of the peronaeus longus.

Insertion

Into the lateral side of the base of the first phalanx of the fifth toe.

Nerve supply

Lateral plantar nerve.

Actions

Flexes the little toe.

Q. Describe the fourth layer of the muscles of the foot.

The fourth layer of the muscles of the foot is the dorsal interossei and the plantar interossei

Dorsal interossei

They are four bipennate muscles and take origin by two heads

Origin

From the adjacent sides of the metatarsal bones.

Insertion

- (i) Into the bases of the first phalanges.
- (ii) Into the aponeurosis of the tendons of the extensor digitorum longus.

The first interossei dorsalis inserted on the medial side of the second toe.

The second, third and fourth dorsal interossei are inserted into the lateral side of the second, third and fourth toes.

Nerve supply

Lateral plantar nerve. The first dorsal interossei receives a twig from the medial branch of the deep peroneal nerve on the dorsum of the foot. The second dorsal interossei receives a twig from the lateral branch of the deep peroneal nerve.

Actions

The dorsal interossei are the abductor muscles from an imaginary line drawn through the axis of the second toe so that the first dorsal interossei muscle draws the second toe on the medial side. The second dorsal interossei muscle draws the second toe on the lateral side

The third and fourth dorsal interossei muscles draw the third and fourth toes towards the lateral side.

Plantar interossei

The plantar interossei are three in number and are situated at the fibular sided metatarsal bones.

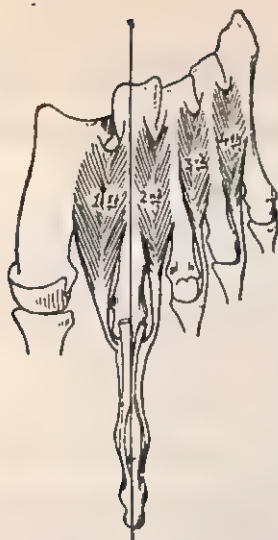


Fig. 62. *Dorsal interossei muscles.*



Fig. 63. *Plantar interossei muscles.*

Origin

From the bases and medial sides of the bodies of the third, fourth and fifth metatarsal bones.

Insertion

Into the medial sides of the bases of the first phalanges of the third, fourth and fifth metatarsal bones.

Nerve supply

Lateral plantar nerve.

Actions

Adduct the third, fourth and fifth toes towards the imaginary line drawn through the axis of the second toe.

Arteries of the glutaecal region

Q. Describe briefly the following arteries :—

- (i) Inferior glutaecal artery.
- (ii) Superior glutaecal artery.
- (iii) Internal pudendal artery.

Inferior glutaecal artery

The inferior glutaecal artery is the biggest branch of the hypogastric artery. It passes from the pelvis through the greater sciatic foramen between the first and second sacral nerves to the glutaecal region below the pyriformis muscle and behind the internal pudendal artery. It then passes along with the sciatic and posterior femoral cutaneous nerves between the greater trochanter femur and the ischial tuberosity of the ischium under cover of the glutaecus maximus. It runs downwards to the posterior surface of the thigh where it supplies the skin and anastomoses with the branches of the perforating arteries of the arteria profunda femoris.

Branches

The following are the branches of the inferior glutaecal artery :—

- (i) Muscular branches.
- (ii) Coccygeal branches.
- (iii) Anastomotic branch.
- (iv) Articular branch.
- (v) Cutaneous branch.

Superior gluteal artery

The superior gluteal artery is also the largest branch of hypogastric artery. It comes out of the pelvis through the greater

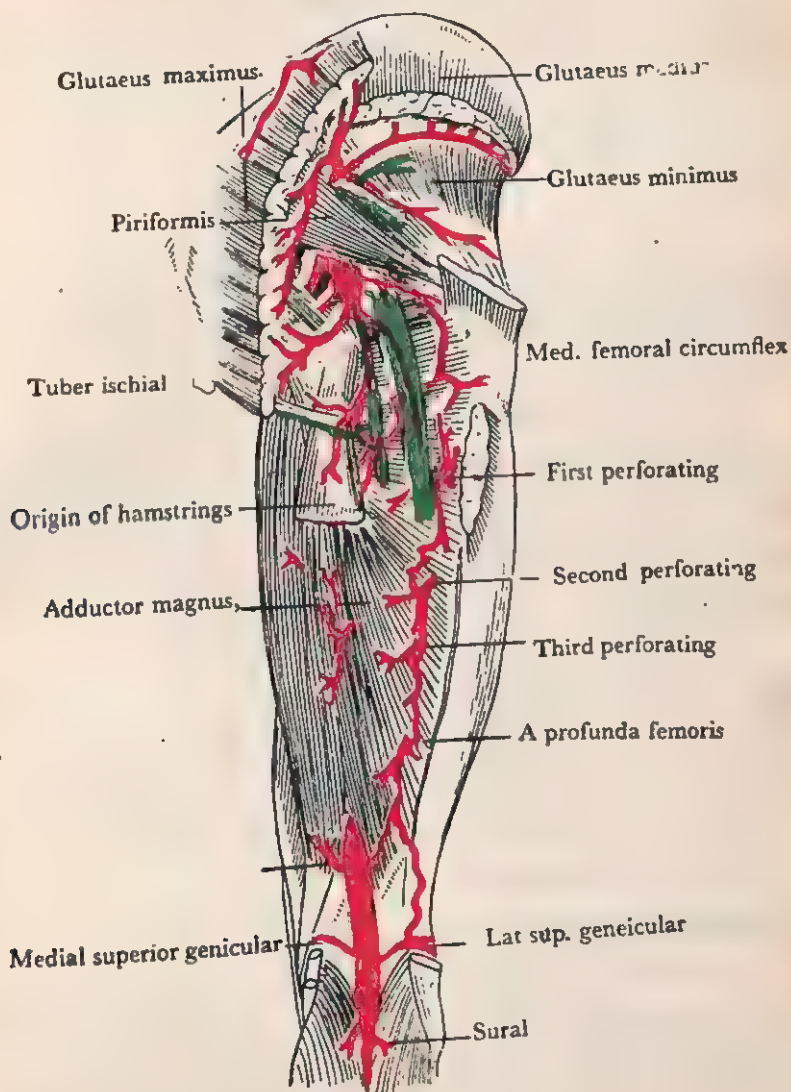


Fig. 64. Arteries of the gluteal region.

sciatic foramen above the pyriformis muscle. It divides into two branches—superficial and deep.

Superficial branch

The superficial branch of the superior glutaecal artery goes deep to the glutaecus maximus muscle and divides into main branches which supply the muscle and anastomoses with the inferior glutaecal artery. Some of the branches perforate the glutaecus maximus muscle at its origin and anastomose with the posterior branches of the lateral sacral arteries.

Deep branch

The deep branch of the superior glutaecal artery is situated under the cover of the glutaecus medius muscle. It divides into two branches—superior division and inferior division.

Superior division

The superior division of the deep branch of the superior glutaecal artery passes along the upper border of the glutaecus minimus and runs up to the anterior superior iliac spine where it anastomoses with the deep circumflex iliac artery and the ascending branch of the lateral circumflex artery.

Inferior division

The inferior division of the deep branch of the superior glutaecal artery crosses the glutaecus minimus muscle and runs up to the greater trochanter of the femur where it divides into branches supplying the glutaecus minimus and glutaecus medius muscles. It then anastomoses with the lateral femoral circumflex artery. Some of its branches supply the hip joint after piercing the glutaecus minimus muscle.

Internal pudendal artery

The internal pudendal artery is one of the main branches of the hypogastric artery. It supplies the external genital organs. It passes out of the pelvis through the lower portion of the greater sciatic foramen below the pyriformis muscle and enters the glutaecal region. It then runs on the posterior

surface of the ischial spine, passes through the lesser sciatic foramen and enters the perinaeum.

The artery then runs along the lateral wall of the ischiorectal fossa after crossing the obturator internus muscle, lying a little above the lower border of the ischial tuberosity. It then runs along the inferior ramus of the ischium and os pubis between the two layers of the fascia of the urogenital diaphragm. Now at a distance of 1 cm behind the pubic urcate ligament the artery pierces the inferior fascia of the urogenital diaphragm and then divides into two branches—dorsal and deep arteries of the penis.

In the gluteal region the artery is under the cover of the gluteus maximus. The pudendal nerve is situated medial to the artery and the nerve to the obturator internus lies lateral to the artery.

Branches

The following are the branches of the internal pudendal artery :—

- (i) Muscular.
- (ii) Inferior haemorrhoidal.
- (iii) Perinaeal.
- (iv) Artery of the urethral bulb.
- (v) Urethral.
- (vi) Deep artery of the penis.
- (vii) Dorsal artery of the penis.

FEMORAL ARTERY

Q. Describe the course, relation and branches of the femoral artery.

The femoral artery is the continuation of the external iliac artery. It extends from the inguinal ligament, midway between the symphysis pubis and the anterior superior iliac spine to the opening in the adductor magnus, where it becomes the

popliteal artery. It occupies the upper two third of the thigh. The proximal part of the femoral artery is contained in the femoral triangle, whereas the lower portion of the femoral artery lies in the adductor canal (Hunter's Canal) distally. The upper two inches of the artery is enclosed within the femoral sheath, along with the femoral vein.

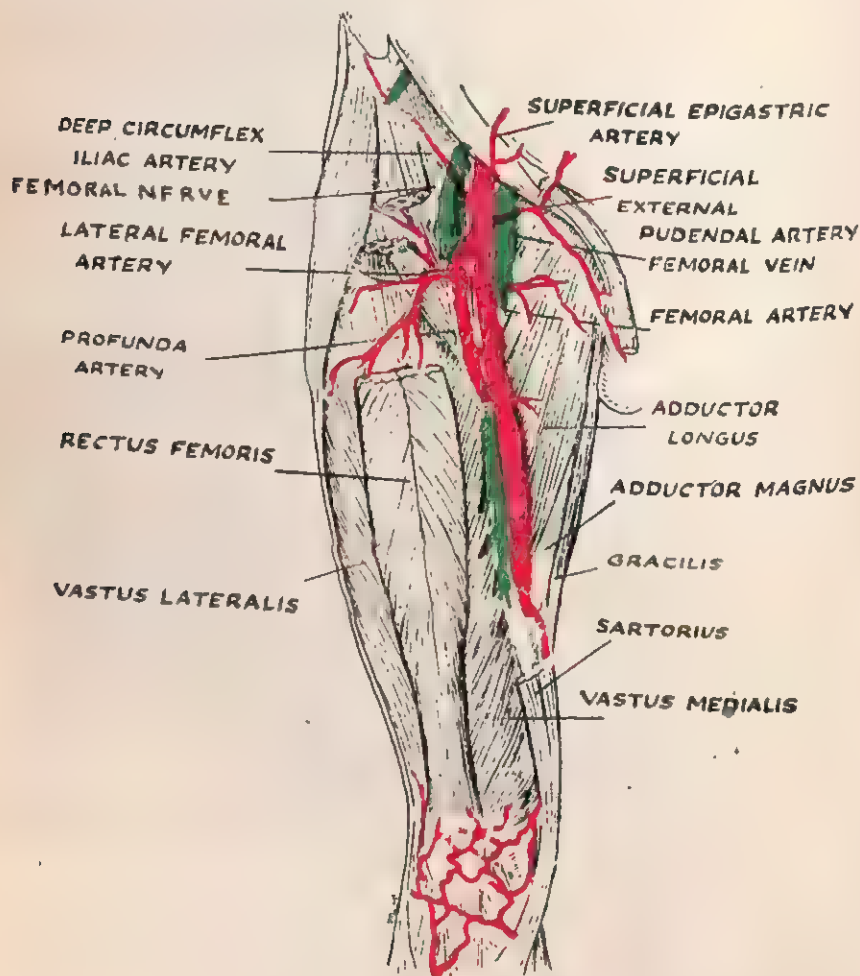


Fig. 65. The right femoral artery

For descriptive purposes the femoral artery is divided into two parts the first part is lying in the femoral triangle and the second part occupies the adductor canal.

Relation

1. The first part or in the femoral triangle.

It extends from the inguinal ligament to the apex of the femoral triangle.

Anterior relation

(i) Skin.

(ii) Superficial fascia.

(iii) Superficial inguinal lymph glands.

(iv) Superficial circumflex iliac vein.

(v) Superficial layer of the fascia lata.

(vi) Anterior portion of the femoral sheath.

(vii) Femoral branch of the genito-femoral nerve which at first lies in front of the artery in the lateral compartment of the femoral sheath and then it lies lateral to the artery.

(viii) Branches of the medial cutaneous nerve cross the artery from lateral to the medial side.

Posterior relation

From above downwards the following structures lie deep or posterior to the artery:—

(i) Posterior layer of the femoral sheath.

(ii) Psoas major.

(iii) Pectineus.

(iv) Adductor longus.

(v) In the distal part of the triangle the artery is separated from the pectineus by the femoral vein and the profunda femoris vessels which lie behind the femoral vein.

(vi) Nerve to the pectineus.

Lateral relation

- (i) Femoral nerve.
- (ii) Saphenous nerve.
- (iii) Nerve to the vastus medialis.
- (iv) Profunda femoris artery is lateral to the artery up to a short distance.

Medial relation

In the upper part of the femoral triangle, the femoral vein lies medial to the artery but in the lower part of the triangle the femoral vein lies posterior to the artery.

2. Second part or in the adductor canal.

The femoral artery is deeply situated in the adductor canal. The following structures lie anterior to the femoral artery:—

- (i) Skin.
- (ii) Superficial fascia.
- (iii) Deep fascia.
- (iv) Sartorius.
- (v) Fibrous roof of the adductor canal.

In the proximal part of the canal, the femoral vein lies posterior to the femoral artery, but distally the femoral vein inclines towards the lateral side and remains on the lateral side of the artery.

The saphenous nerve, in the proximal part of the canal, lies on the lateral side of the femoral artery, but in the distal part the saphenous nerve lies in front of the artery and then crosses the artery and lies on the medial side of the artery.

The following structures lie posterior to the artery:—

- (i) Adductor longus.
- (ii) Adductor magnus.

Branches

The following are the branches of the femoral artery:—

- (i) Superficial epigastric.
- (ii) Superficial circumflex iliae.
- (iii) Superficial external pudendal.
- (iv) Deep external pudendal.
- (v) Muscular.
- (vi) Profunda femoris.
- (vii) Descending genicular or highest genicular.

Q. Describe the origin insertion, nerve supply, action and relations of the popliteus muscle. (*Lucknow University, 1961.*)

The popliteus muscle is situated at the back of the knee and forms the floor of the popliteal fossa. It is a triangular muscle.

Origin

(i) From the groove on the lateral surface of the lateral condyle of the femur.

(ii) From the oblique popliteal ligament of the knee joint.

Insertion

It is inserted into the posterior surface of the triangular area above the popliteal line of the upper part of the body of the tibia.

Nerve Supply

It is supplied by the medial popliteal nerve.

Action

It flexes the knee joint. It also rotates the leg medially on the thigh.

Relation**Anterior**

At its origin of the muscle :—

- (i) The tendon of the biceps femoris.
- (ii) The fibular collateral ligament of the knee joint.

3. The popliteal fascia separates the popliteal muscle from the gastrocnemius, plantaris, popliteal vessels and the medial plantar nerve

Posterior

The oblique popliteal ligament of the knee joint and the posterior surface of the upper part of the tibia are in relation with the deep surface of the popliteus muscle.

THE POPLITEAL ARTERY

Q. Describe the popliteal artery.

The popliteal artery is in continuation of the femoral artery. It runs through the popliteal fossa. It begins at the opening of the adductor magnus at the point of junction which is situated between the upper two-third and the lower one-third of the thigh. It passes downwards and lateralwards in the inter-condyloid fossa of the femur and ends at the lower border of the popliteus muscle vertically. At this level it divides into two branches— anterior and posterior tibial arteries.

Relations

Anterior relation

- (i) Popliteal surface of the femur.
- (ii) Back of the knee-joint.
- (iii) Fascia covering the popliteus muscle.

Posterior relation

- (i) Semi-membranous (above).
- (ii) Gastrocnemius and plantaris (below).
- (iii) Tibial nerve and popliteal vein.

The tibial nerve crosses the artery from the lateral to medial side in the middle. The popliteal vein lies between the tibial nerve and artery.

Lateral relations

- | | | | |
|-------|------------------------------------|---|---------|
| (i) | Biceps femoris. | } | (Above) |
| (ii) | Tibial nerve. | | |
| (iii) | Popliteal vein. | | |
| (iv) | Lateral condyle of the femur. | | |
| (v) | Plantaris. | } | (Below) |
| (vi) | Lateral head of the gastrocnemius. | | |

Medial relations

- | | | | |
|-------|-----------------------------------|---|---------|
| (i) | Semi-membranosus. | } | (Above) |
| (ii) | Medial condyle of the femur. | | |
| (iii) | Tibial nerve. | } | (Below) |
| (iv) | Popliteal vein. | | |
| (v) | Medial head of the gastrocnemius. | | |

Applied anatomy

The popliteal artery may be torn by the passing of the wheel of the cart over the knee. It may break by over-extension of the knee-joint, or be lacerated by the fracture of the lower end of the femur, or by the dislocation of the knee-joint. It is also a seat of aneurysm.

Branches

The following are the branches of the popliteal artery :—

- (i) Cutaneous
- (ii) Muscular
 - (a) Superior muscular branches.
 - (b) Sural arteries.
- (iii) Genicular.
 - (a) Superior medial genicular.
 - (b) Superior lateral genicular.
 - (c) Middle genicular.
 - (d) Inferior medial genicular.
 - (e) Inferior lateral genicular.

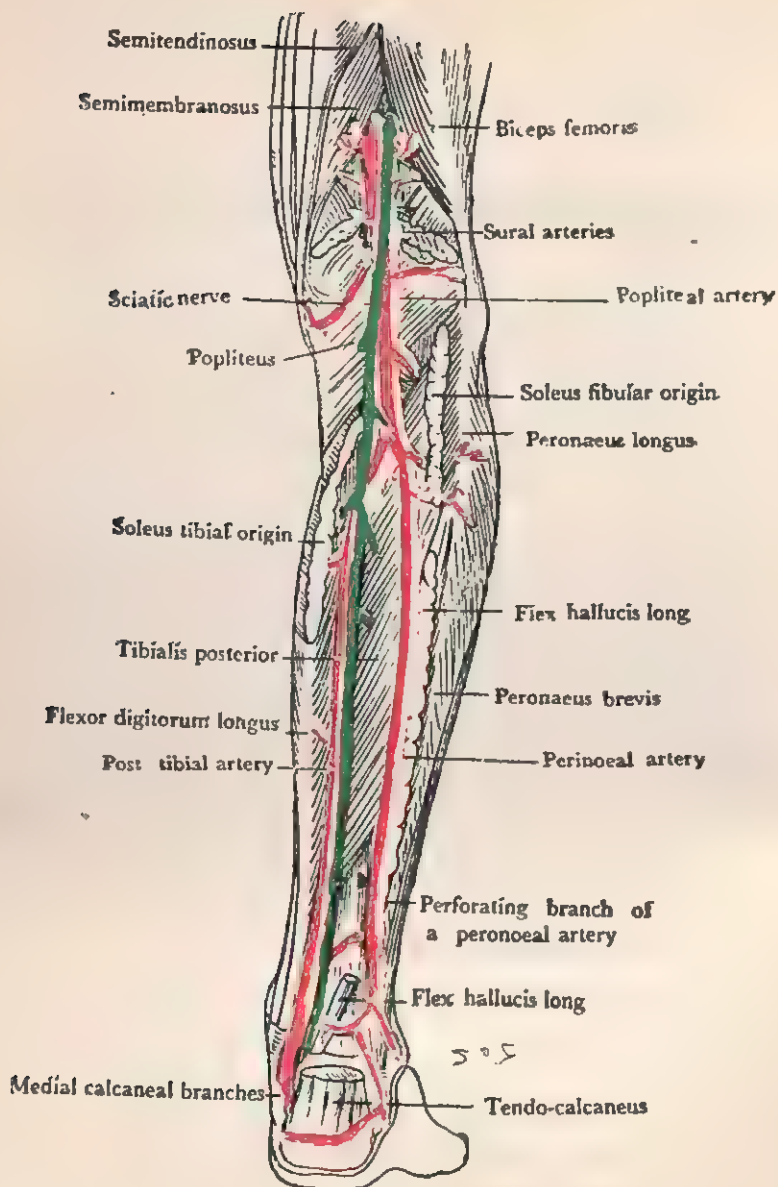


Fig. 66. Popliteal artery.

POSTERIOR TIBIAL ARTERY

Q. Describe the course and relation of the posterior tibial artery.

The posterior tibial artery commences at the bifurcation of the popliteal artery at the lower margin of the popliteus muscle. It runs downwards and medialwards on the posterior surface of the leg, passing underneath the acinate ligament, midway between the medial malleolus and medial process of the tuberosity of the calcaneum and terminates beneath the origin of the adductor hallucis, by dividing into two branches—medial and lateral plantar arteries.

The artery is situated deep in the upper two-thirds of the leg, lying between the superficial and deep muscles in the interval between the tibia and the fibula.

In the lower part of the leg the artery becomes superficial, lying on the posterior surface of the tibia at medial side of the tendo-calcaneus.

Relations:

In the upper two-thirds of the leg, the artery is covered by the gastrocnemius, the soleus and the deep transverse fascia of the leg. In the lower part of the leg the artery becomes superficial and is covered by the skin, the superficial fascia and the flexor retinaculum. Beneath the artery, the following structures lie from above downwards :—

- (i) Tibialis posterior muscle.
- (ii) Flexor digitorum longus.
- (iii) Posterior surface of tibia.
- (iv) Medial ligament of the ankle-joint.

In the distal part of the leg the tendo-calcaneus is situated on the lateral side of the artery.

In the upper part of the leg the tibial nerve is situated on the medial side of the artery.

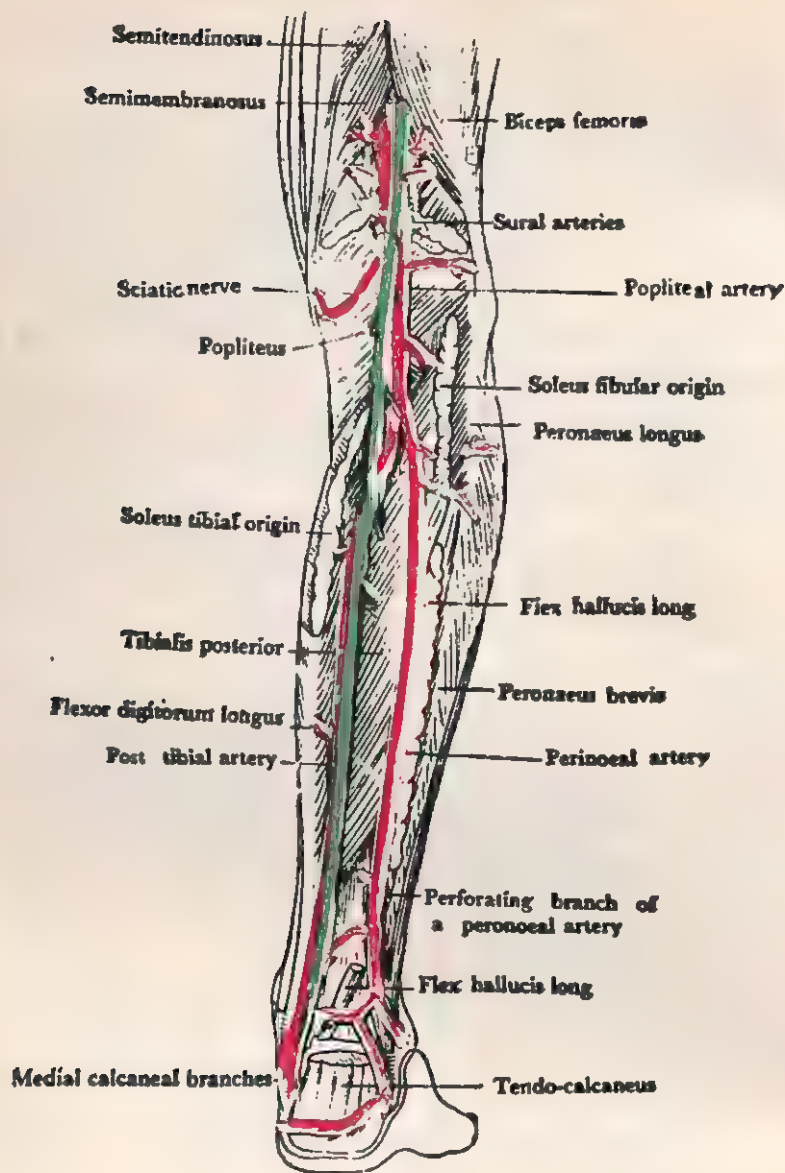


Fig. 67. Posterior tibial and peroneal arteries.

In the middle portion of the leg, the tibial nerve crosses the artery from the medial to the lateral side.

In the lower part of the leg, the tibial nerve lies on the lateral side of the artery which is accompanied by two veins.

Branches

The following are the branches of the posterior tibial artery :—

- (i) Fibular.
- (ii) Peronaeal.
- (iii) Nutrient.
- (iv) Muscular.
- (v) Communicating.
- (vi) Posterior medial malleolar
- (vii) Medial calcaneal.
- (viii) Medial plantar.
- (ix) Lateral plantar.

Q. What are the structures which pass from the posterior surface of the leg to the sole of the foot between the medial malleolus and calcanium underneath the lacinate ligament ?

The following are the structures passing from the posterior surface of the leg to the sole between the medial malleolus and calcanium from the medial to the lateral side :—

- (i) Tendon of tibialis posterior.
- (ii) Tendon of flexor-digitorum longus.
- (iii) Posterior tibial artery and vein on either side.
- (iv) Tibial nerve.
- (v) Tendon of flexor hallucis longus.

Q. Describe the commencement, termination, course, relations and branches of the peronaeal artery.

The peronaeal artery is the largest branch of the posterior tibial artery. It begins at the lower border of the popliteus

muscle. It runs obliquely downwards and lateralwards to the fibular side, lying on the tibialis posterior muscle. It then goes along the postero-medial border of the fibula between the tibialis posterior and the flexor hallucis longus or it passes deep to the flexor hallucis longus. A little above the ankle-joint the artery comes out from the deep surface of the flexor hallucis longus and divides into lateral calcaneal branches which supply the lateral and posterior surfaces of the calcaneus.

Branches

The following are the branches of the peroneal artery :—

- (i) Muscular.
- (ii) Nutrient.
- (iii) Perforating.
- (iv) Communicating.
- (v) Lateral calcaneal.

Q. Describe the lateral plantar artery.

The lateral plantar artery is one of the largest terminal branch of the posterior tibial artery. It first runs obliquely and lateralwards to the base of the 5th metatarsal bone with the lateral plantar nerve which lies on its medial side. From the base of the 5th metatarsal bone it turns medially to the interval between the bases of the 1st and 2nd metatarsal bones where it unites with the dorsal pedis artery. It thus forms the plantar arch.

As the artery passes laterally, it at first lies between the calcaneum and the abductor hallucis. It then lies between the flexor digitorum brevis and flexor digitorum accessorius. As it runs to the base of the 5th metatarsal bone, it lies between the flexor digitorum brevis and the abductor digiti minimi and is covered by the plantar aponeurosis, superficial fascia and skin.

Branches

- I. Muscular.
- II. Superficial.
- III. Anastomotic.

The muscular branches supply the adjoining muscles.

Superficial branches supply the skin, subcutaneous tissue of the lateral part of the sole.

The anastomotic branches anastomose with the branches of the lateral tarsal and arcuate arteries.

Q. Describe the Plantar arch.

The plantar arch is formed by the lateral plantar artery with the dorsal pedis artery. The plantar arch extends from the base of the 5th metatarsal bone to the proximal part of the 1st interosseous space where it joins with the dorsal pedis artery and thus completes the palmar arch. It is situated deeply and lies on the bases of the 2nd, 3rd and 4th metatarsal bones and corresponding interosseous muscles and the oblique head of the adductor hallucis. The arch forms a convex shape pointing towards the digits.

Branches

1. Three perforating and four plantar metatarsal branches.
2. Twigs to the skin, the fasciae and the muscles of the sole.

Q. Describe the course, relation and branches of the dorsal pedis artery.

The dorsal pedis artery is the continuation of the anterior tibial artery. It lies midway between two malleoli at the dorsum of the ankle-joint. It runs from the ankle-joint towards the medial side of the dorsum of the foot to the first intermetatarsal space. Here it divides into two branches viz. first dorsal metatarsal and deep plantar arteries.

Relations

It lies anterior to the articular capsule of the ankle-joint, the talus, navicular, and second cuneiform bones and the ligaments attached to them. The dorsal pedis artery is covered anteriorly by the skin, the superficial fascia and the cruciate crural ligaments.

The artery is crossed at its termination by the first tendon of the extensor digitorum brevis. The tendon of extensor hallucis longus lies medially to the artery and the first tendon of the extensor digitorum longus and medial terminal branch of the deep peroneal nerve lies on the lateral side of the artery.

Branches

The following are the branches of the dorsalis pedis artery :—

- I. Lateral tarsal.
- II. Medial tarsal.
- III. Arcuate.
- IV. First dorsal metatarsal.
- V. Deep plantar.

ANASTOMOSIS IS ROUND THE KNEE JOINT

Q. Describe the anastomosis around the knee-joint.

(Lucknow University, 1966)

The following arteries take part in anastomosis around the knee-joint and form the deep net-work which lies on the lower end of the femur and the upper end of the tibia around the articular surfaces :—

- I. Medial superior genicular.
- II. Lateral superior genicular.
- III. Medial inferior genicular.
- IV. Lateral inferior genicular.
- V. Highest genicular.
- VI. Descending branch of the lateral femoral circumflex.
- VII. Circumflex fibular.
- VIII. Anterior tibial recurrent.

Medial superior genicular :—

The medial superior genicular artery is the branch of the popliteal artery and anastomoses with the highest genicular

artery, a branch of the femoral artery and the medial inferior genicular artery, a branch of the popliteal artery.

The other branches ramify close to the surface of the femur and anastomoses with the lateral superior genicular artery.

Lateral superior genicular—

The lateral superior genicular artery is the branch of the popliteal artery. It divides into superficial and deep branches.

The superficial branch anastomoses with the descending branch of the lateral femoral circumflex artery and with the lateral inferior genicular artery.

The deep branch anastomoses with the medial superior genicular artery and forms an arch across the front of the femur with the highest genicular artery.

Medial inferior genicular :—

The medial inferior genicular artery anastomoses with the lateral inferior genicular artery and the medial superior genicular artery.

Lateral inferior genicular :—

The lateral inferior genicular artery anastomoses with the medial superior genicular artery, the lateral superior genicular artery and the anterior tibial recurrent artery.

Highest genicular :—

The highest genicular artery divides into saphenous and musculo-articular branches.

The saphenous branch anastomoses with the medial inferior genicular artery.

The musculo-articular branch anastomoses with the medial superior genicular artery and the anterior tibial recurrent artery.

Descending branch of the lateral femoral circumflex:—

The descending branch of the lateral femoral circumflex artery is the branch of the arteria profunda femoris and anastomoses with the superior lateral genicular, a branch of the popliteal artery.

Circumflex fibular—

The circumflex fibular artery is the branch of the posterior tibial artery and anastomoses with the lateral inferior genicular artery.

Anterior tibial recurrent—

The anterior tibial recurrent artery is a branch of the anterior tibial artery and anastomoses with the genicular branches of the popliteal artery and with the highest genicular artery.

The superficial net-work of the arteries lies between the fascia and the skin round about the patella—one above the patella and the other below the patella behind the ligamentum patellae.

ANASTOMOSIS ROUND THE ANKLE JOINT

Q. Describe the anastomosis around the knee.

(Lucknow University, 1966)

An arterial anastomosis takes place around the lower end of the femur and the upper end of the tibia above the patella.

The superficial anastomosis lies between the fascia and the skin around the patella. The three distinct arches are the first arch above the patella in the superficial fibres of the quadriceps femoris, the second arch under the cover of the ligamentum patellae just below the patella and the third arch on the tibia just above the insertion of the ligamentum patellae. The anastomoses are numerous on the anterior surface and the sides of the knee.

The deep network of the arteries is situated on the lower end of the femur and the upper end of the tibia around the knee-joint and gives out branches to the soft parts covering the joint, the bones, the ligaments and the synovial membranes. Its largest branch enters the bone and supplies the marrow.

The following eight arteries take part in anastomosis around the knee-joint:—

- (i) Medial superior genicular.
- (ii) Lateral superior genicular.
- (iii) Medial inferior genicular.
- (iv) Lateral inferior genicular.
- (v) Highest genicular.
- (vi) Descending branch of the lateral femoral circumflex.
- (vii) Fibular.
- (viii) Anterior tibial recurrent.

Medial superior genicular artery

The medial superior genicular artery springs from the popliteal artery, winding round the femur above the medial condyle to the front of the knee-joint. It passes in front of the semi-membranous and the semi-tendinosus, above the medial head of the gastrocnemius. Then it runs deep to the adductor magnus where it divides into two branches—the one anastomoses with the highest genicular and the medial inferior genicular arteries after supplying the *vestus medialis*, the other anastomoses with the lateral superior genicular artery, ramifying on the surface of the femur.

Lateral superior genicular artery

The lateral superior genicular artery springs from the popliteal artery, winding round the femur above the lateral condyle to the front of the knee-joint. It passes beneath the tendon of the biceps femoris. It divides into two branches—superficial and deep.

Superficial branch

The superficial branch of the lateral genicular artery anastomoses with the descending branch of the lateral femoral circumflex artery and with the lateral inferior genicular artery after supplying the *vastus lateralis*.

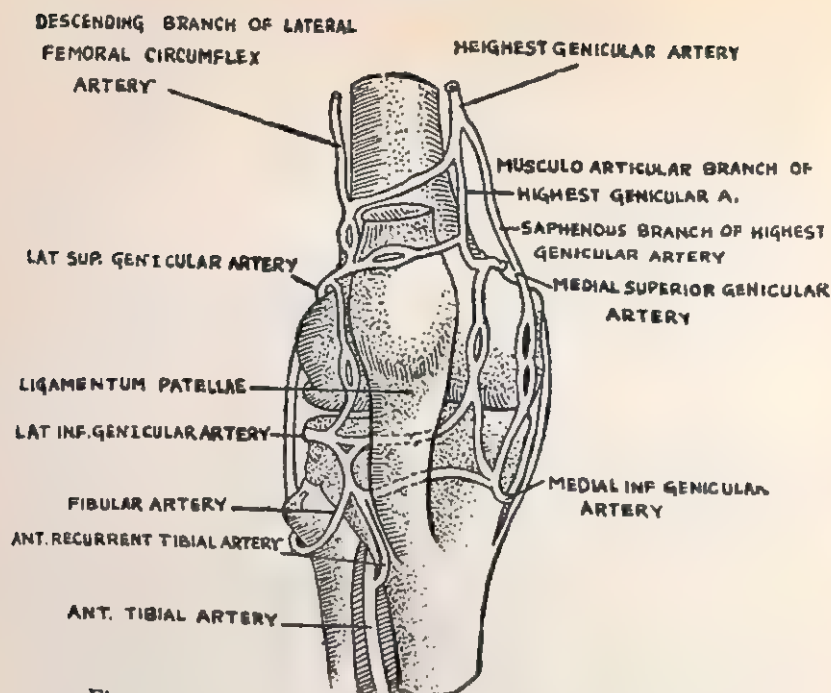


Fig. 68. Arterial anastomosis around the knee joint.

Deep branch

The deep branch of the lateral superior genicular artery anastomoses with the medial superior genicular artery and the highest genicular artery, forming an arch in front of the femur.

Medial inferior genicular artery

The medial inferior genicular artery springs from the popliteal artery below the medial head of the gastrocnemius. It runs along the upper border of the popliteus and then passes below the medial condyle of the tibia behind the tibial collateral ligament. It then goes upwards to the front and the medial side of the knee-joint, and anastomoses with the lateral inferior genicular artery and the medial superior genicular artery. It supplies the knee-joint and the upper end of the tibia.

Lateral inferior genicular artery

The lateral inferior genicular artery springs from the popliteal artery below the lateral head of the gastrocnemius. It

passes lateralwards crossing the popliteus muscle and runs above the head of the fibula to the anterior surface of the knee-joint. During its course it passes behind the lateral head of the gastrocnemius, the fibular collateral ligament and the tendon of the biceps femoris. It gives out branches which anastomose with the medial inferior genicular, the lateral superior genicular and the anterior tibial recurrent arteries.

Highest genicular artery

The highest genicular artery springs from the femoral artery just before the femoral artery enters the adductor canal. It divides into the saphenous and the musculo-articular branches.

Saphenous branch

The saphenous branch accompanies the saphenous nerve after piercing the roof of the adductor canal to the medial side of the knee. It runs between the sartorius muscles and the gracilis muscles and anastomoses with the medial inferior genicular artery.

Musculo-articular branch

The musculo-articular branch runs in the substance of the vastus medialis and then passes in front of the adductor magnus to the medial side of the knee-joint. Here it anastomoses with the medial superior genicular artery and the anterior tibial recurrent artery.

Fibular artery

The fibular artery springs from the posterior tibial artery. It runs lateralwards round the neck of the fibula passing through the soleus. It anastomoses with the lateral inferior genicular artery.

Descending branch of the lateral femoral circumflex artery

The descending branch of the lateral femoral circumflex artery springs from the arteria profunda femoris. It anastomoses with the superior lateral genicular artery, a branch of the popliteal artery.

Anterior tibial recurrent artery

The anterior tibial recurrent artery springs from the anterior tibial artery. It runs on the tibialis anterior muscle and anastomoses with the genicular branches of the popliteal artery and the highest genicular artery and ramifies on the front and the sides of the knee-joint forming the patellar network.

Q. Describe the anastomosis around the ankle joint.

The anastomosis of the arteries takes place around the ankle-joint as indicated below:—

On the lateral side of the ankle-joint, the following arteries take part in anastomosing around the ankle-joint:

- (i) Lateral malleolar.
- (ii) Perforating branch of peroneal.
- (iii) Terminal part of peroneal.
- (iv) Lateral tarsal.

On the medial side of the ankle-joint the following arteries take part in anastomosing around the ankle-joint.

- (i) Medial malleolar branch of the anterior tibial.
- (ii) Small twigs from the medial calcanean branches of the posterior tibial.

ANTERIOR TIBIAL ARTERY

Q. Describe the commencement, termination, course, relations and branches of the anterior tibial artery.

The anterior tibial artery is the smaller branch of the popliteal artery. It springs from the back of the leg, at the lower border of the popliteus muscle opposite the tuberosity of the tibia. It then runs between the two heads of the tibialis posterior and enters the front of the leg by passing through an opening in the upper part of the crural interosseous membrane, lying medial to the neck of the fibula. It then proceeds vertically downwards on the anterior surface of the crural interosseous membrane, approaching the tibia near the lower part of the leg where it passes in front of the ankle-joint, midway between the two medial

and lateral malleoli. Here the artery is continued as the dorsal pedis artery on the dorsum of the foot. The artery is accompanied by two veins.

Relations

In the upper two-thirds of the leg, the anterior tibial artery is placed on the anterior surface of the crural interosseous membrane, covered by the muscles on either side.

In the lower one-third of the leg, the anterior tibial artery lies on the front of the tibia and the ankle-joint where the artery is crossed by the extensor hallucis longus.

In the upper one-third of the leg, the artery is situated between the tibialis anterior and the extensor digitorum longus.

In the middle one third of the leg, the artery lies between the tibialis anterior and the extensor hallucis longus.

In the lower one-third of the leg at the ankle-joint, the artery is crossed by the tendon of the extensor hallucis longus from lateral to the medial side. The artery lies between the tendon of the extensor hallucis longus on the medial side and the first tendon of the extensor digitorum longus on the lateral side of the artery. At this level the artery lies superficial and is covered by the skin, the fascia and the transverse and the cruciate ligaments.

Branches

The following are the branches of the anterior tibial artery :—

- (i) Posterior tibial recurrent.
- (ii) Anterior tibial recurrent.
- (iii) Muscular.
- (iv) Anterior medial malleolar.
- (v) Anterior lateral malleolar.

DORSAL PEDIS ARTERY

Q. Describe the dorsal pedis artery and mention its branches.

The dorsal pedis artery is the continuation of the anterior tibial artery. It begins on the anterior surface of the ankle-joint

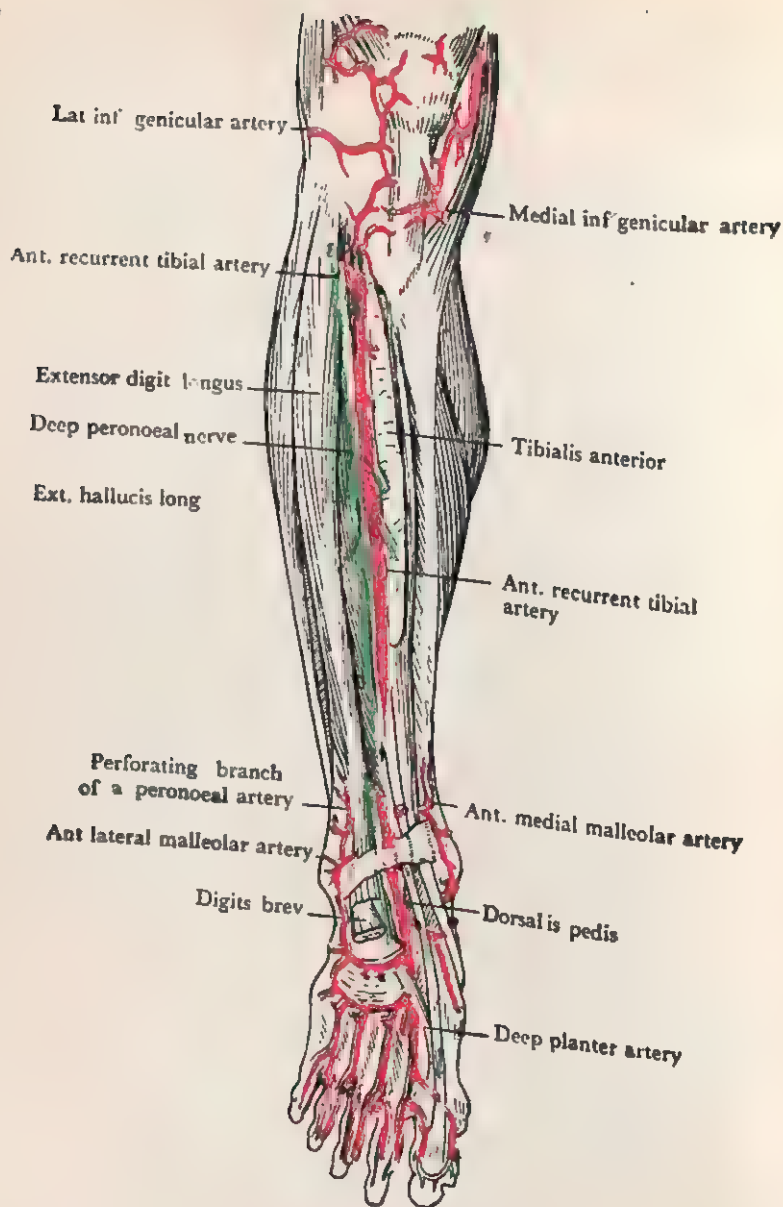


Fig. 69. Anterior tibial artery and dorsal pedis artery.

midway between the medial and lateral malleoli. It passes in front of the dorsum of the foot along with the anterior tibial nerve. Its medial branch goes to the proximal portion of the first intermetatarsal space where it divides into two branches—first dorsal metatarsal and the deep plantar.

First dorsal metatarsal artery

It runs on the first dorsal interosseous muscle and divides into two branches at the cleft between the first and second toes and supplies the medial border of the great toe and the adjacent sides of the great and second toes.

Deep plantar artery

It enters the sole of the foot between the two heads of the first dorsal interosseous muscle and unites with the lateral plantar artery forming the plantar arch. At its meeting point, the first plantar metatarsal artery arises from the deep plantar artery.

Relations

The dorsal pedis artery lies on the anterior surface of the articular capsule of the ankle-joint, the talus, the navicular and the second cuneiform bones and the attached ligaments of the bones. It is covered by the skin, the fascia and the cruciate crural ligament. At its termination, the artery is crossed by the first tendon of the extensor digitorum brevis. On the lateral side of the artery is the first tendon of the extensor digitorum longus and the terminal branch of the deep peroneal nerve and on the medial side of the artery is the tendon of the extensor hallucis longus.

Branches

The following are the branches of the dorsal pedis artery :—

- (i) Lateral tarsal.
- (ii) Medial tarsal.
- (iii) Arcuate.
- (iv) First dorsal metatarsal.
- (v) Deep plantar.

LATERAL PLANTAR ARTERY

Q. Describe the lateral plantar artery.

The lateral plantar artery is the largest branch of the posterior tibial artery. It springs underneath the flexor retinaculum, accompanied by veins and the lateral plantar nerve. It crosses the sole lateralwards obliquely to the base of the fifth metatarsal bone with the lateral plantar nerve lying on the medial side of the

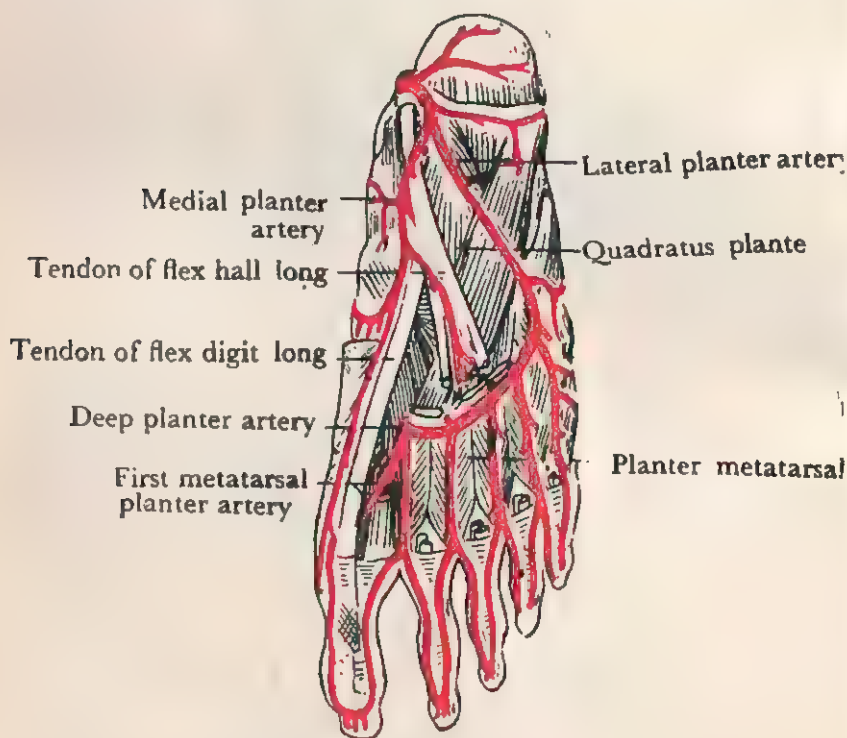


Fig. 70. Lateral plantar artery.

artery. From the base of the fifth metatarsal bone the artery turns medially along with the deep branch of the lateral plantar nerve forming a convexity towards the toes. At the interval between the bases of the first and second metatarsal bones, it unites with the dorsal pedis artery and forms the plantar arch.

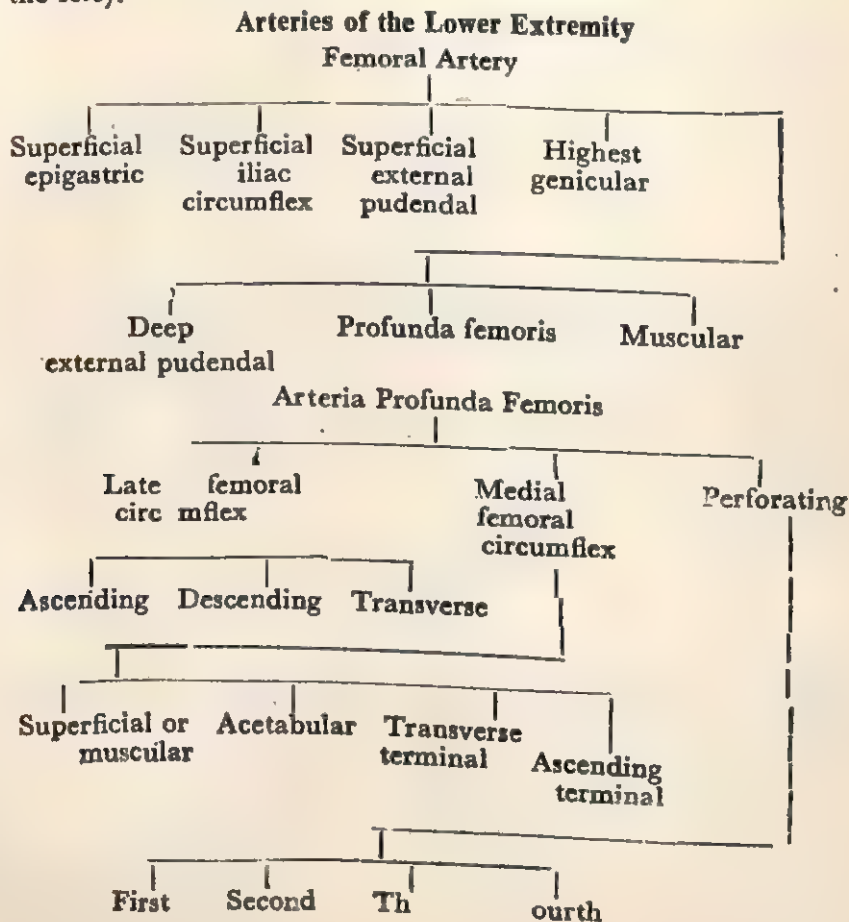
Relations

The lateral plantar artery lies first between the calcaneum and the abductor hallucis. Secondly, the artery lies between the flexor digitorum brevis and the flexor digitorum accessorius (quadratus plantae). Thirdly, the artery lies between the flexor digitorum brevis and the abductor digiti quinti as it turns to the fifth metatarsal bone. The artery is covered by the plantar aponeurosis, the superficial fascia and the skin.

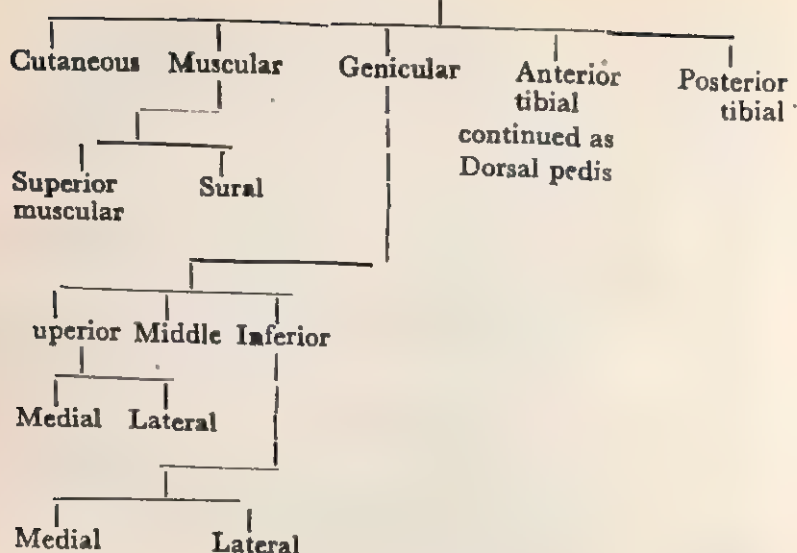
Branches

The following are the branches of the lateral plantar artery:—

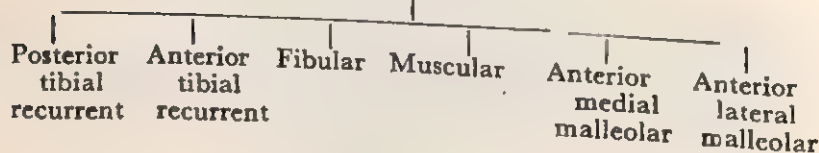
- (i) Muscular (supplies the adjacent muscles).
- (ii) Cutaneous (supplies the lateral and posterior parts of the sole).



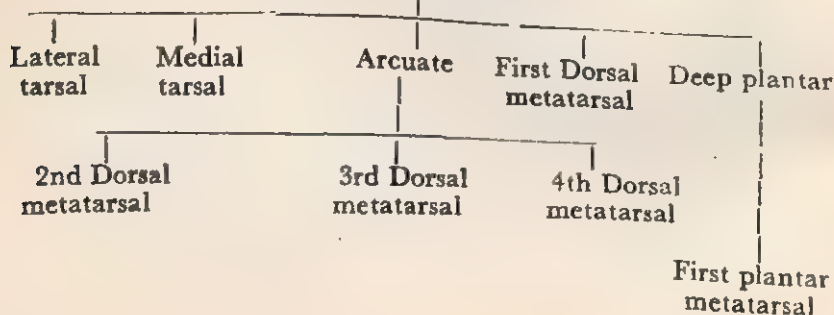
Popliteal Artery

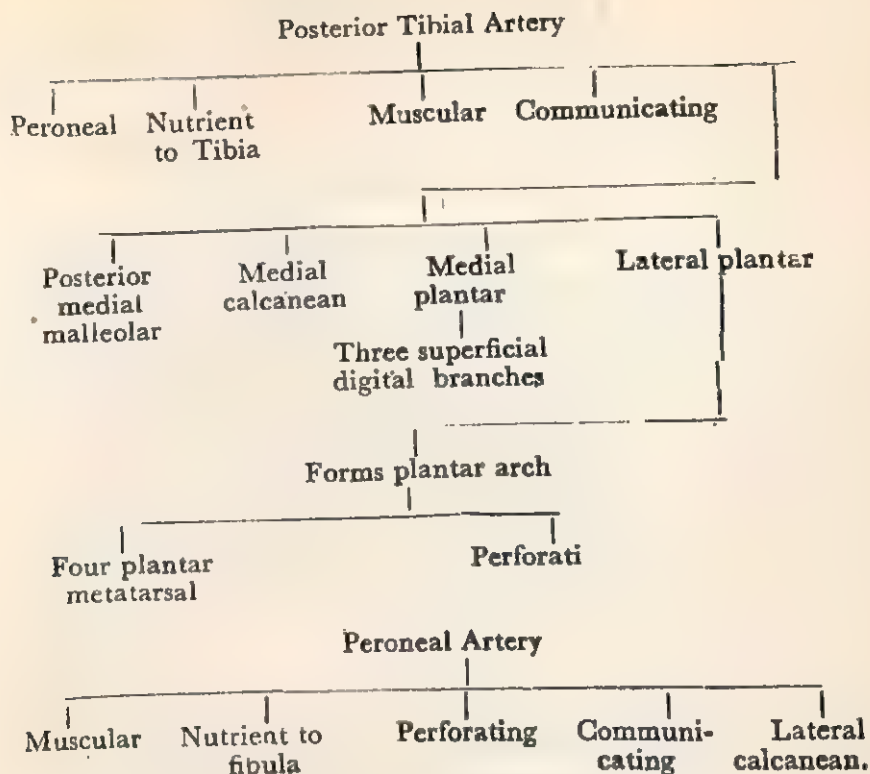


Anterior Tibial Artery



Dorsal pedis artery





Q. Describe the Ankle-joint. Give its immediate anterior relation.
(Lucknow University, 1965)

The ankle-joint is a hinge joint. The lower ends of the tibia and the fibula articulate with the surface of the body of the talus and thus form the ankle-joint.

The joint is surrounded by a capsule and the bones are connected by the following ligaments :

- (i) Capsular.
- (ii) Anterior.
- (iii) Posterior.
- (iv) Deltoid or Medial.
- (v) Lateral.

Capsular. The capsular ligament surrounds the ankle-joint. It is attached above to the borders of the anterior surfaces of the tibia and the malleoli, and below it is attached to the dorsal surface of the neck of the talus.

Anterior. The anterior ligament is attached to the margin of the lower end of the tibia and below it is attached to the talus.

Posterior. The posterior ligament is attached above to the posterior aspect of the lateral malleolus and the posterior margin of the articular surface of the tibia and below it is attached to the articular surface of talus

Deltoid or Medial. The deltoid or medial ligament is a thick flat, strong, triangular band. It is attached above to the apex and anterior and posterior borders of the medial malleolus, and below, it is attached to the tuberosity of the navicular bone,

the plantar Calcaneo-navicular ligament, the sustentaculum tali, and talus.

Lateral--The lateral ligament consists of three bands :

- (i) Anterior talo-fibular.
- (ii) Calcaneo-fibular
- (iii) Posterior talo-fibular.

Anterior talo fibular. The anterior talo-fibular ligament passes from the anterior margin of the lateral malleolus to the talus.

Calcaneo-fibular. The calcaneo-fibular ligament runs from the tip of lateral malleolus to a tubercle on the lateral surface of the calcaneus.

Posterior talo-fibular. The posterior talo-fibular ligament is attached above to the fossa at the medial and posterior parts of the lateral malleolus and below to the posterior process of the talus.

Arteries

The following arteries supply the ankle-joint :—

- (i) Malleolar branch of the anterior tibial artery.
- (ii) Branches from the peroneal artery.

Nerves

The following nerves supply the ankle-joint :—

- (i) Anterior tibial nerve.
- (ii) Posterior tibial nerve.

Movements of the Joint

The only movements of the ankle-joint are dorsiflexion and extension or plantar flexion.

Muscles producing the movements

The following muscles are dorsiflexors.

Dorsiflexion

- (i) Tibialis anterior.
- (ii) Extensor digitorum longus.

(iii) Extensor hallucis longus.

(iv) Peroneus tertius.

The following muscles are the extensor or plantar flexor :—

Extension or Plantar flexion.

(i) Gastrocnemius (chief muscle)

(ii) Soleus.

(iii) Plantaris

(iv) Tibialis posterior

(v) Flexor hallucis longus

(vi) Flexor digitorum longus

} Lesser degree muscles.

Relation

The following structures have the immediate anterior relation :—

From the medial to the lateral side.

(i) Tibialis anterior.

(ii) Extensor hallucis longus.

(iii) Anterior tibial vessels and nerve.

(iv) Extensor digitorum longus.

(v) Peroneus tertius.

The anterior tibial vessels and nerve lie between the extensor digitorum longus and extensor hallucis longus.

Q. Write short notes :—

(a) Medial collateral ligament of the knee-joint.

(b) Abductor hallucis muscle.

(Lucknow University, 1961)

(a) Medial collateral ligament of the knee-joint :—

The medial collateral ligament of the knee-joint is attached above to the medial epicondyle of the femur, just below the adductor tubercle and below it is attached to the medial condyle of the tibia and the upper part of the medial surface of the tibia.

The sartorius, gracilis, and semi-tendinous cross the ligament at its lower part. The inferior medial genicular vessels and nerve

lie deep to the ligament. The upper part of the ligament is connected to the medial meniscus :—

(b) Abductor hallucis muscle :—

The abductor hallucis is the first layer of the plantar region of the sole of the foot. It lies on the medial side of the foot.

Origin

(i) From the medial process of the tuberosity of the calcaneum.

(ii) From the lacinate ligament.

(iii) From the plantar aponeurosis.

(iv) From the intermuscular septum between abductor hallucis and flexor digitorum brevis.

Insertion

It is inserted into the medial side of the base of the 1st phalanx of the great toe.

Nerve Supply

By the medial plantar nerve.

Action

It flexes the proximal phalanx of the great toe.

MOVEMENTS OF ANKLE-JOINT

Q. What are the muscles that take part in the movements of the ankle-joint ? Mention its immediate relation.

The only movements of the ankle-joint are dorsiflexion and extension or plantar flexion.

The following muscles take part in the movement of the dorsiflexion.

Dorsiflexion

(i) Tibialis anterior.

(ii) Extensor hallucis longus.

(iii) Extensor digitorum longus.

(iv) *Peroneus tertius*.

The following muscles take part in the movement of the extension or plantar flexion :—

Extension or Plantar flexion(i) *Gastrocnemius* (chief muscle)(ii) *Soleus*.(iii) *Plantaris*.(iv) *Tibialis posterior*.(v) *Flexor digitorum longus*(vi) *Flexor hallucis longus*.

} Lesser
degree
muscles.

Immediate relation of the Ankle joint

The tendons of the muscles, the arteries, the veins, the nerves are in relation with the ankle-joint.

Anterior relation

From the tibial to the fibular side are as follows :—

(i) *Tibialis anterior*.(ii) *Extensor hallucis longus*.(iii) *Anterior tibial vessels*.(iv) *Anterior tibial nerve*.(v) *Extensor digitorum longus*.(vi) *Peroneus tertius*.

On the anterior surface of the ankle joint, the anterior tibial vessels and nerve lie between the *extensor hallucis longus* and the *extensor digitorum longus*.

Posterior relation

From the tibial to the fibular side are as follows :—

(i) *Tibialis posterior*.(ii) *Flexor digitorum longus*.(iii) *Posterior tibial artery*.(iv) *Posterior tibial nerve*.

(v) Flexor hallucis longus.

On the posterior surface of the ankle-joint, the posterior tibial vessels and nerve lie between the flexor digitorum longus and the flexor hallucis longus.

On the fibular side, the peroneus longus and the peroneus brevis lie superficial to the calcaneofibular ligament, whereas on the tibial side the tendons of the tibialis posterior and the flexor digitorum longus cross the deltoid ligament superficially.

FEMORAL NERVE

Q. Describe the femoral nerve and mention its branches.

The femoral nerve is the biggest branch of the lumbar plexus formed by dorsal branches of the anterior divisions of the second third and fourth lumbar nerves. It runs first through the psoas major muscle, and then passes between the psoas major and iliacus muscles. It then enters the thigh behind the inguinal ligament and divides into anterior and posterior branches. It is separated from the femoral artery by the psoas major muscle.

Anterior division

The anterior division of the femoral nerve gives branches to the intermediate cutaneous and medial cutaneous nerves.

Intermediate cutaneous nerve

The intermediate cutaneous nerve is one of the branches of the anterior division of the femoral nerve. It comes to the thigh in two or three branches after piercing the fascia lata a little below the inguinal ligament. These branches run vertically downwards on the anterior surface of the thigh as far as the knee supplying the skin. These branches end in the patellar plexus.

The lateral branch of the intermediate cutaneous nerve unites with the lumbo-inguinal nerve, a branch of the genito-femoral nerve.

Medial cutaneous nerve

The medial cutaneous nerve is the branch of the anterior division of the femoral nerve. It lies first on the lateral side of the

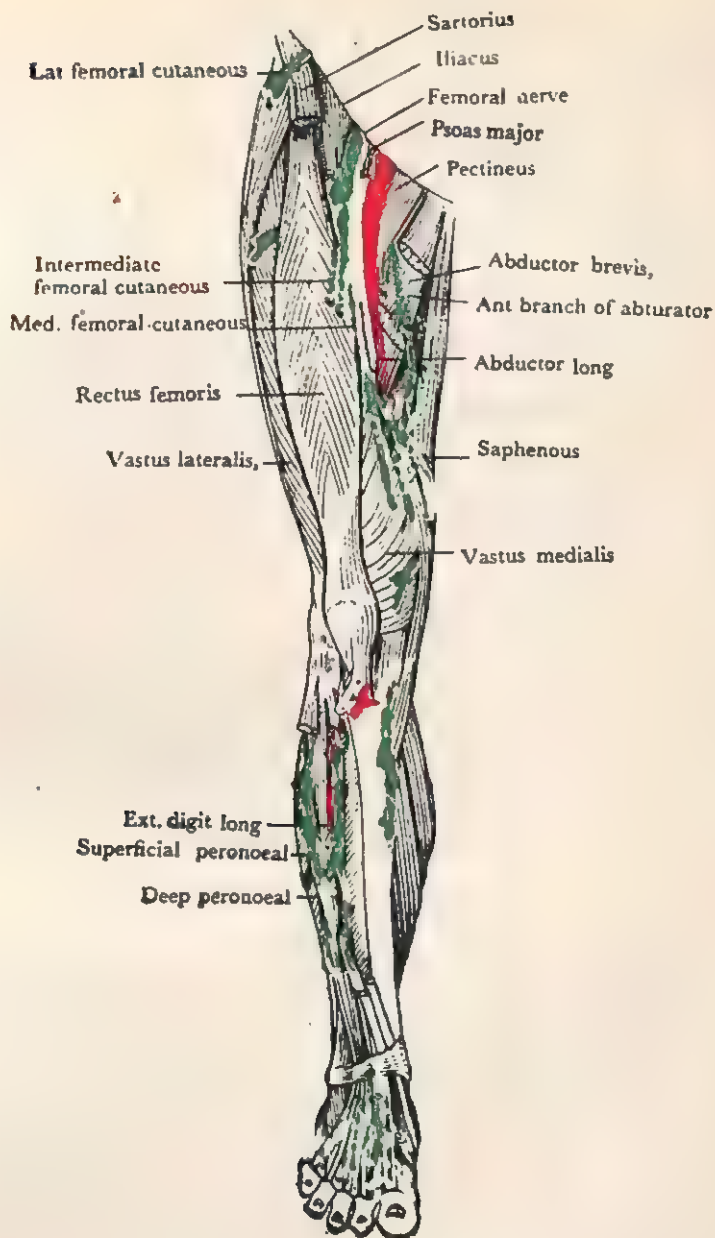


Fig. 71. The Nerves of the thigh and leg (anterior aspect).

femoral artery and then crosses the artery anteriorly from lateral to the medial side at the apex of the femoral triangle. It divides into anterior and posterior branches.

Before the medial cutaneous nerve branches off, it supplies the skin of the medial side of the thigh and the neighbourhood of the great saphenous vein.

Anterior branch

The anterior branch of the medial cutaneous nerve descends on the sartorius muscle and divides into two branches at the junction of the middle with the lower one-third of the thigh after perforating the fascia lata. One branch supplies the skin on the medial side of the thigh and the knee. The other branch crosses to the lateral side of the patella and joins with the infra-patellar branch of the saphenous nerve.

Posterior branch

The posterior branch of the medial cutaneous nerve passes behind the sartorius muscle up to the knee where it pierces the fascia lata and joins with the saphenous nerve and gives off the cutaneous branches. It then runs on the medial side of the leg to supply the skin. At the lower margin of the adduct longus, it joins with the branches of the saphenous and obturator nerves to form a plexus known as the sub-sartorial plexus.

Posterior division

The posterior division of the femoral nerve gives off a branch as the saphenous nerve. It gives muscular branches to the quadriceps femoris and the articular branches to the knee-joint.

The saphenous nerve is the branch of the posterior division of the femoral nerve. It is the biggest cutaneous branch of the femoral nerve. The saphenous nerve lies on the lateral side of the femoral artery at the lower part of the femoral triangle. It then crosses the artery anteriorly from the lateral to the medial side in the adductor canal (Hunter's canal). At the distal end of the adductor canal, the artery comes out and pierces the roof

of the canal, accompanied by the saphenous branch of the descending genicular artery. It then descends vertically on the medial side of the knee behind the sartorius muscle. From the knee it runs on the medial side of the leg and divides into two branches which accompany the long saphenous vein. The larger branch of the saphenous nerve lies posterior to the vein, whereas the smaller branch of the saphenous nerve lies anterior to the vein. At the ankle, the larger branch passes in front of the medial malleolus and comes to the medial side of the foot and runs as far as the metatarsophalangeal joint of the great toe.

The smaller branch runs along the margin of the tibia and ends at the ankle.

In the adductor canal the saphenous nerve sends a branch to the subsartorial plexus. It also sends an infra-patellar branch at the lower part of the thigh piercing the sartorius muscle, supplying the skin on the anterior surface of the knee and joining the patellar plexus.

The saphenous nerve gives off branches to the skin of the medial side of the leg and the foot.

SCIATIC NERVE

Q. Describe the course and relation of the sciatic nerve.

The sciatic nerve is the largest flattened band of the sacral plexus. It is the biggest nerve of the body. It comes out from the pelvis through the greater sciatic foramen below the piriformis muscle. It then runs on the posterior surface of the thigh after passing between the greater trochanter of the femur and the tuberosity of the ischium. At the lower one-third of the thigh, the sciatic nerve divides into two large branches—tibial (medial popliteal) and common peroneal (lateral popliteal) nerves.

Relations

The sciatic nerve lies on the posterior surface of the ischium, the nerve to the quadratus femoris, the obturator internus, the gemellus superior, the gemellus inferior and the quadratus femoris muscles. The posterior femoral cutaneous nerve and the inferior gluteal artery lie on the medial side of the sciatic nerve. It is covered by the glutacus maximus muscle. It then lies on the adductor magnus and the long head of the biceps femoris crosses the nerve.

The nerve gives off the articular and muscular branches.

Summary

Posterior relation

- (i) Glutacus maximus.
- (ii) Long head of Biceps femoris.

Anterior relation

- (i) Ischium.
- (ii) Nerve to the quadratus femoris.
- (iii) Gemellus superior.
- (iv) Obturator internus.
- (v) Gemellus inferior.
- (vi) Quadratus femoris.
- (vii) Posterior surface of Adductor magnus.

Medial relation

- (i) Semi membranousus.

MEDIAL POPLITEAL NERVE

Q. Describe the medial popliteal (tibial) nerve.

The medial popliteal nerve is the largest terminal branch of the sciatic nerve. Its fibres are derived from the ventral branches of the anterior primary rami of the fourth and fifth lumbar

and the first, second and third sacral nerves. It runs on the back of the thigh and passes through the middle of the popliteal fossa to the distal border of the popliteal muscle. It accompanies the popliteal artery deep to the soleus.

From the distal border of the popliteus muscle the medial popliteal nerve is continuous in the posterior surface of the leg as the posterior tibial nerve.

Relations

The medial popliteal nerve lies deep to the hamstring muscles above and becomes superficial in the popliteal fossa below. In the upper part of the popliteal fossa, the nerve lies lateral to the popliteal vessels. At the knee-joint the nerve becomes superficial to these vessels and it crosses the vessels from the lateral to the medial side and remains on the medial side of the popliteal artery. In the lower part of the popliteal fossa, the nerve is covered by the two heads of the gastrocnemius.

Branches

The following are the branches of the medial popliteal nerve :—

- (i) Articular.
- (ii) Muscular.
- (iii) Sural.

POSTERIOR TIBIAL NERVE

Q Describe the commencement, termination, course, relation and branches of the posterior tibial nerve.

The posterior tibial nerve is the continuation of the medial popliteal nerve. It commences at the lower border of the popliteus muscle and runs along with the posterior tibial vessels to the interval between the heel and the medial malleolus. It then passes behind the flexor retinaculum into the sole of the foot by dividing into the medial and lateral plantar nerves. On the

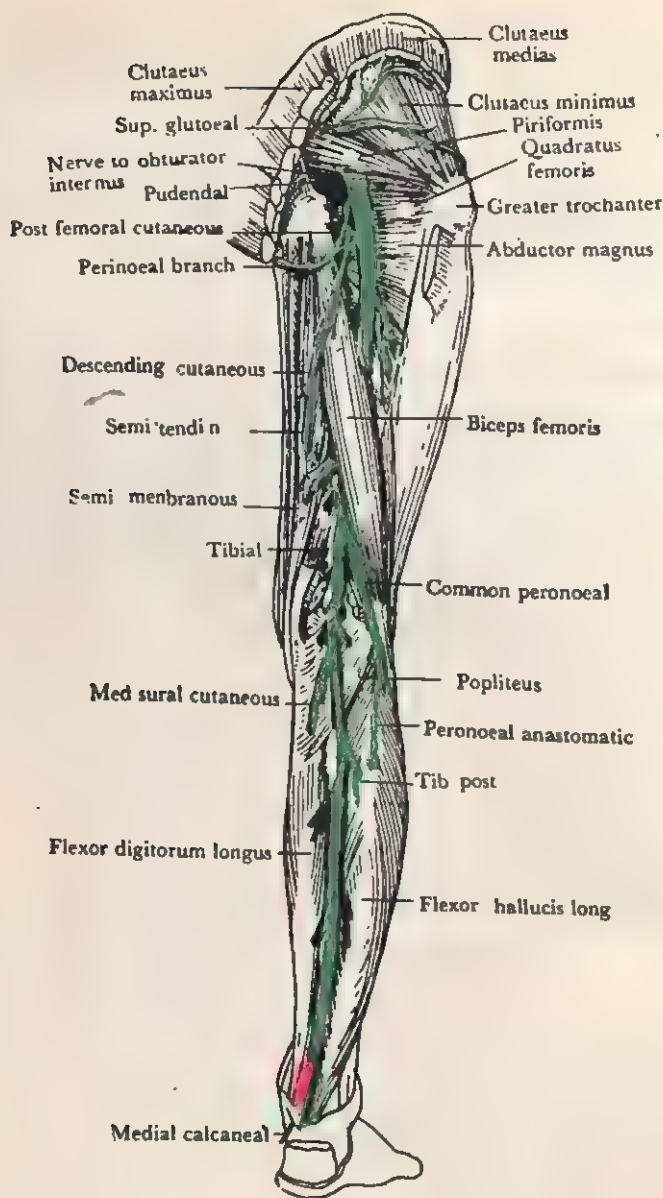


Fig. 72. Nerves of the back of the thigh and leg.

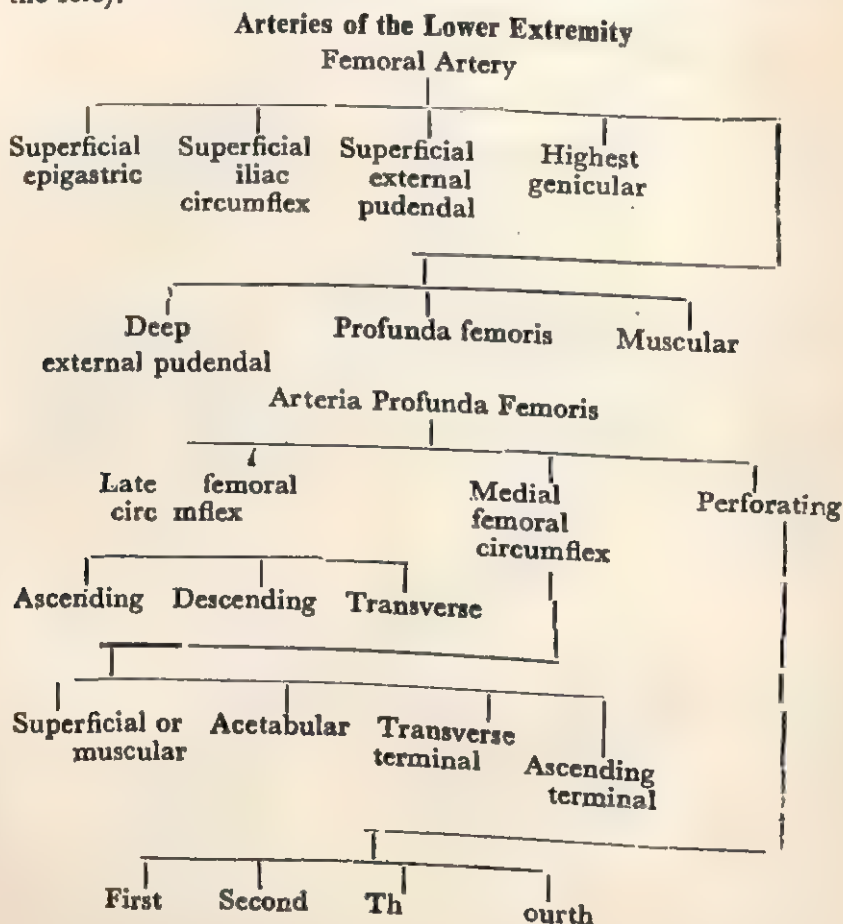
Relations

The lateral plantar artery lies first between the calcaneum and the abductor hallucis. Secondly, the artery lies between the flexor digitorum brevis and the flexor digitorum accessorius (quadratus plantae). Thirdly, the artery lies between the flexor digitorum brevis and the abductor digiti quinti as it turns to the fifth metatarsal bone. The artery is covered by the plantar aponeurosis, the superficial fascia and the skin.

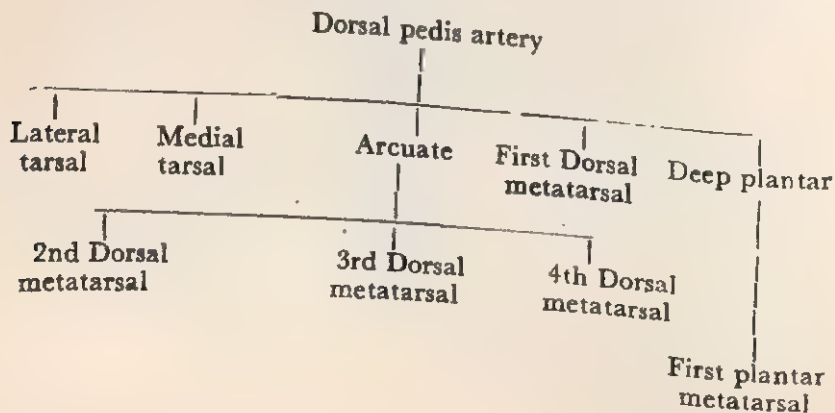
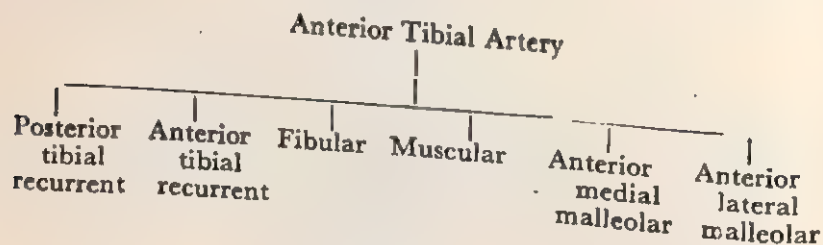
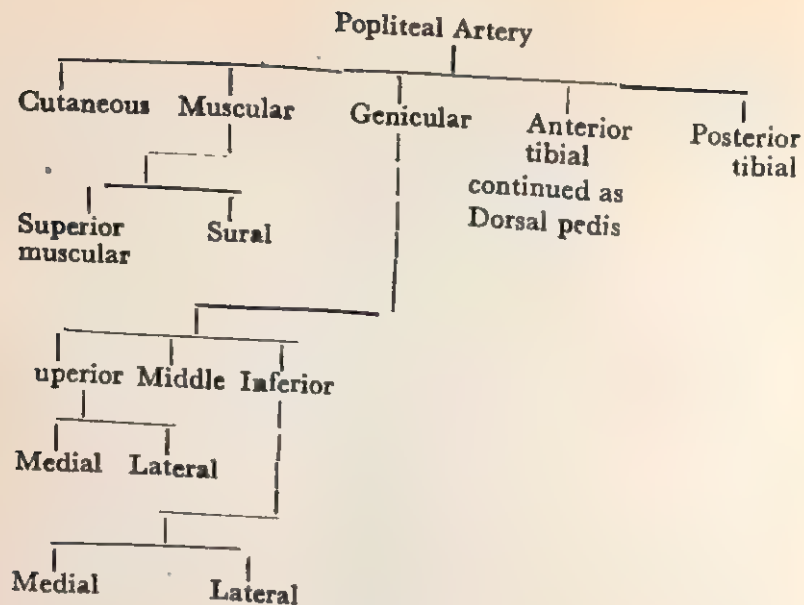
Branches

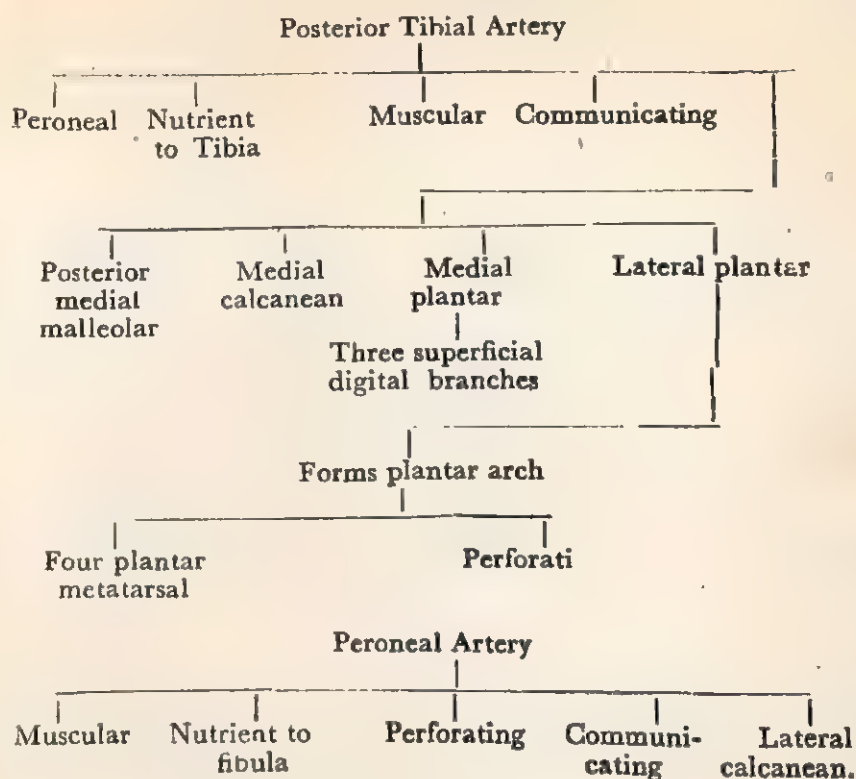
The following are the branches of the lateral plantar artery:—

- (i) Muscular (supplies the adjacent muscles).
- (ii) Cutaneous (supplies the lateral and posterior parts of the sole).



EXTREMITIES





Q. Describe the Ankle-joint. Give its immediate anterior relation.
(Lucknow University, 1965)

The ankle-joint is a hinge joint. The lower ends of the tibia and the fibula articulate with the surface of the body of the talus and thus form the ankle-joint.

The joint is surrounded by a capsule and the bones are connected by the following ligaments :

- (i) Capsular.
- (ii) Anterior.
- (iii) Posterior.
- (iv) Deltoid or Medial.
- (v) Lateral.

Capsular. The capsular ligament surrounds the ankle-joint. It is attached above to the borders of the anterior surfaces of the tibia and the malleoli, and below it is attached to the dorsal surface of the neck of the talus.

Anterior. The anterior ligament is attached to the margin of the lower end of the tibia and below it is attached to the talus.

Posterior. The posterior ligament is attached above to the posterior aspect of the lateral malleolus and the posterior margin of the articular surface of the tibia and below it is attached to the articular surface of talus

Deltoid or Medial. The deltoid or medial ligament is a thick flat, strong, triangular band. It is attached above to the apex and anterior and posterior borders of the medial malleolus, and below, it is attached to the tuberosity of the navicular bone,

the plantar Calcaneo-navicular ligament, the sustentaculum tali, and talus.

Lateral--The lateral ligament consists of three bands :

- (i) Anterior talo-fibular.
- (ii) Calcaneo-fibular
- (iii) Posterior talo-fibular.

Anterior talo fibular. The anterior talo-fibular ligament passes from the anterior margin of the lateral malleolus to the talus.

Calcaneo-fibular. The calcaneo-fibular ligament runs from the tip of lateral malleolus to a tubercle on the lateral surface of the calcaneus.

Posterior talo-fibular. The posterior talo-fibular ligament is attached above to the fossa at the medial and posterior parts of the lateral malleolus and below to the posterior process of the talus.

Arteries

The following arteries supply the ankle-joint :—

- (i) Malleolar branch of the anterior tibial artery.
- (ii) Branches from the peroneal artery.

Nerves

The following nerves supply the ankle-joint :—

- (i) Anterior tibial nerve.
- (ii) Posterior tibial nerve.

Movements of the Joint

The only movements of the ankle-joint are dorsiflexion and extension or plantar flexion.

Muscles producing the movements

The following muscles are dorsiflexors.

Dorsiflexion

- (i) Tibialis anterior.
- (ii) Extensor digitorum longus.

(iii) Extensor hallucis longus.

(iv) Peroneus tertius.

The following muscles are the extensor or plantar flexor :—

Extension or Plantar flexion.

(i) Gastrocnemius (chief muscle)

(ii) Soleus.

(iii) Plantaris

(iv) Tibialis posterior

(v) Flexor hallucis longus

(vi) Flexor digitorum longus

} Lesser degree muscles.

Relation

The following structures have the immediate anterior relation :—

From the medial to the lateral side.

(i) Tibialis anterior.

(ii) Extensor hallucis longus.

(iii) Anterior tibial vessels and nerve.

(iv) Extensor digitorum longus.

(v) Peroneus tertius.

The anterior tibial vessels and nerve lie between the extensor digitorum longus and extensor hallucis longus.

Q. Write short notes :—

(a) Medial collateral ligament of the knee-joint.

(b) Abductor hallucis muscle.

(Lucknow University, 1961)

(a) Medial collateral ligament of the knee-joint :—

The medial collateral ligament of the knee-joint is attached above to the medial epicondyle of the femur, just below the adductor tubercle and below it is attached to the medial condyle of the tibia and the upper part of the medial surface of the tibia.

The sartorius, gracilis, and semi-tendinous cross the ligament at its lower part. The inferior medial genicular vessels and nerve

lie deep to the ligament. The upper part of the ligament is connected to the medial meniscus :—

(b) Abductor hallucis muscle :—

The abductor hallucis is the first layer of the plantar region of the sole of the foot. It lies on the medial side of the foot.

Origin

(i) From the medial process of the tuberosity of the calcaneum.

(ii) From the lacinate ligament.

(iii) From the plantar aponeurosis.

(iv) From the intermuscular septum between abductor hallucis and flexor digitorum brevis.

Insertion

It is inserted into the medial side of the base of the 1st phalanx of the great toe.

Nerve Supply

By the medial plantar nerve.

Action

It flexes the proximal phalanx of the great toe

MOVEMENTS OF ANKLE-JOINT

Q. What are the muscles that take part in the movements of the ankle-joint ? Mention its immediate relation.

The only movements of the ankle-joint are dorsiflexion and extension or plantar flexion.

The following muscles take part in the movement of the dorsiflexion.

Dorsiflexion

(i) Tibialis anterior.

(ii) Extensor hallucis longus.

(iii) Extensor digitorum longus.

(iv) *Peroneus tertius*.

The following muscles take part in the movement of the extension or plantar flexion :—

Extension or Plantar flexion(i) *Gastrocnemius* (chief muscle)(ii) *Soleus*.(iii) *Plantaris*.(iv) *Tibialis posterior*.(v) *Flexor digitorum longus*(vi) *Flexor hallucis longus*.

} Lesser
degree
muscles.

Immediate relation of the Ankle joint

The tendons of the muscles, the arteries, the veins, the nerves are in relation with the ankle-joint.

Anterior relation

From the tibial to the fibular side are as follows :—

(i) *Tibialis anterior*.(ii) *Extensor hallucis longus*.

(iii) Anterior tibial vessels.

(iv) Anterior tibial nerve.

(v) *Extensor digitorum longus*.(vi) *Peroneus tertius*.

On the anterior surface of the ankle joint, the anterior tibial vessels and nerve lie between the *extensor hallucis longus* and the *extensor digitorum longus*.

Posterior relation

From the tibial to the fibular side are as follows :—

(i) *Tibialis posterior*.(ii) *Flexor digitorum longus*.

(iii) Posterior tibial artery.

(iv) Posterior tibial nerve.

(v) Flexor hallucis longus.

On the posterior surface of the ankle-joint, the posterior tibial vessels and nerve lie between the flexor digitorum longus and the flexor hallucis longus.

On the fibular side, the peroneus longus and the peroneus brevis lie superficial to the calcaneofibular ligament, whereas on the tibial side the tendons of the tibialis posterior and the flexor digitorum longus cross the deltoid ligament superficially.

FEMORAL NERVE

Q. Describe the femoral nerve and mention its branches.

The femoral nerve is the biggest branch of the lumbar plexus formed by dorsal branches of the anterior divisions of the second third and fourth lumbar nerves. It runs first through the psoas major muscle and then passes between the psoas major and iliacus muscles. It then enters the thigh behind the inguinal ligament and divides into anterior and posterior branches. It is separated from the femoral artery by the psoas major muscle.

Anterior division

The anterior division of the femoral nerve gives branches to the intermediate cutaneous and medial cutaneous nerves.

Intermediate cutaneous nerve

The intermediate cutaneous nerve is one of the branches of the anterior division of the femoral nerve. It comes to the thigh in two or three branches after piercing the fascia lata a little below the inguinal ligament. These branches run vertically downwards on the anterior surface of the thigh as far as the knee supplying the skin. These branches end in the patellar plexus.

The lateral branch of the intermediate cutaneous nerve unites with the lumbo-inguinal nerve, a branch of the genito-femoral nerve.

Medial cutaneous nerve

The medial cutaneous nerve is the branch of the anterior division of the femoral nerve. It lies first on the lateral side of the

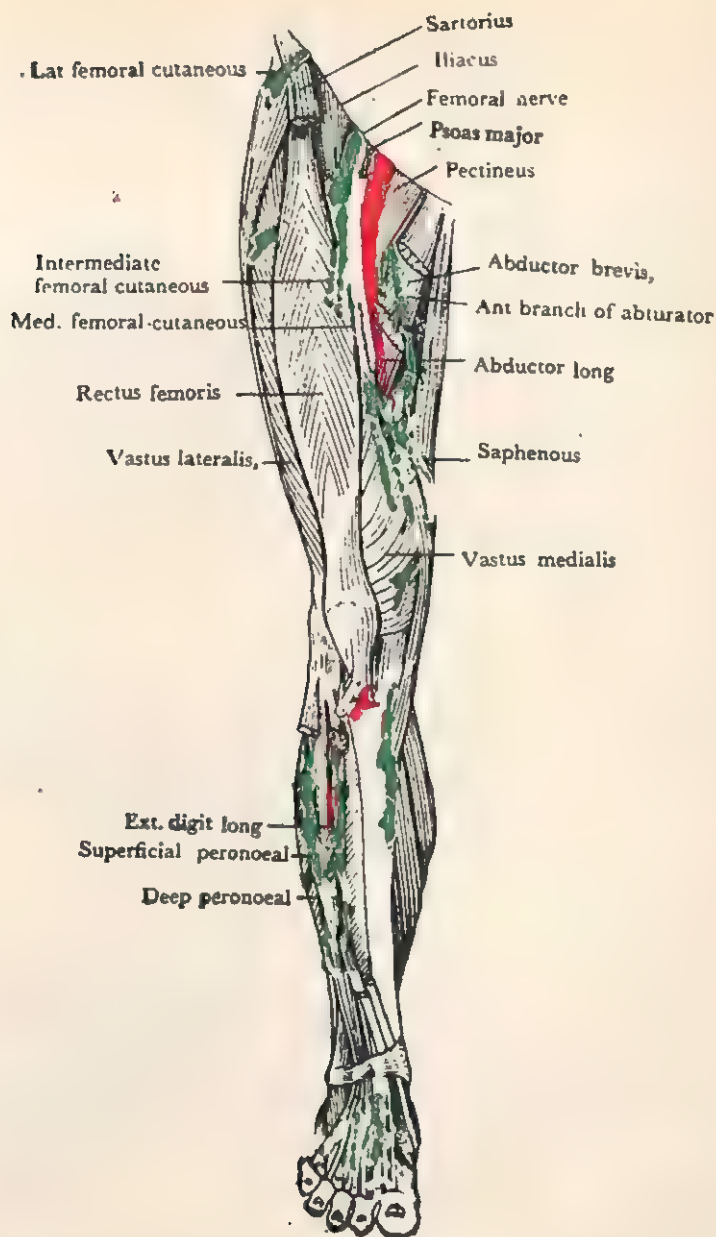


Fig. 71. The Nerves of the thigh and leg (anterior aspect).

femoral artery and then crosses the artery anteriorly from lateral to the medial side at the apex of the femoral triangle. It divides into anterior and posterior branches.

Before the medial cutaneous nerve branches off, it supplies the skin of the medial side of the thigh and the neighbourhood of the great saphenous vein.

Anterior branch

The anterior branch of the medial cutaneous nerve descends on the sartorius muscle and divides into two branches at the junction of the middle with the lower one-third of the thigh after perforating the fascia lata. One branch supplies the skin on the medial side of the thigh and the knee. The other branch crosses to the lateral side of the patella and joins with the infra-patellar branch of the saphenous nerve.

Posterior branch

The posterior branch of the medial cutaneous nerve passes behind the sartorius muscle up to the knee where it pierces the fascia lata and joins with the saphenous nerve and gives off the cutaneous branches. It then runs on the medial side of the leg to supply the skin. At the lower margin of the adduct longus, it joins with the branches of the saphenous and obturator nerves to form a plexus known as the sub-sartorial plexus.

Posterior division

The posterior division of the femoral nerve gives off a branch as the saphenous nerve. It gives muscular branches to the quadriceps femoris and the articular branches to the knee-joint.

The saphenous nerve is the branch of the posterior division of the femoral nerve. It is the biggest cutaneous branch of the femoral nerve. The saphenous nerve lies on the lateral side of the femoral artery at the lower part of the femoral triangle. It then crosses the artery anteriorly from the lateral to the medial side in the adductor canal (Hunter's canal). At the distal end of the adductor canal, the artery comes out and pierces the roof

of the canal, accompanied by the saphenous branch of the descending genicular artery. It then descends vertically on the medial side of the knee behind the sartorius muscle. From the knee it runs on the medial side of the leg and divides into two branches which accompany the long saphenous vein. The larger branch of the saphenous nerve lies posterior to the vein, whereas the smaller branch of the saphenous nerve lies anterior to the vein. At the ankle, the larger branch passes in front of the medial malleolus and comes to the medial side of the foot and runs as far as the metatarsophalangeal joint of the great toe.

The smaller branch runs along the margin of the tibia and ends at the ankle.

In the adductor canal the saphenous nerve sends a branch to the subsartorial plexus. It also sends an infra-patellar branch at the lower part of the thigh piercing the sartorius muscle, supplying the skin on the anterior surface of the knee and joining the patellar plexus.

The saphenous nerve gives off branches to the skin of the medial side of the leg and the foot.

SCIATIC NERVE

Q. Describe the course and relation of the sciatic nerve.

The sciatic nerve is the largest flattened band of the sacral plexus. It is the biggest nerve of the body. It comes out from the pelvis through the greater sciatic foramen below the piriformis muscle. It then runs on the posterior surface of the thigh after passing between the greater trochanter of the femur and the tuberosity of the ischium. At the lower one-third of the thigh, the sciatic nerve divides into two large branches—tibial (medial popliteal) and common peroneal (lateral popliteal) nerves.

Relations

The sciatic nerve lies on the posterior surface of the ischium, the nerve to the quadratus femoris, the obturator internus, the gemellus superior, the gemellus inferior and the quadratus femoris muscles. The posterior femoral cutaneous nerve and the inferior gluteal artery lie on the medial side of the sciatic nerve. It is covered by the gluteus maximus muscle. It then lies on the adductor magnus and the long head of the biceps femoris crosses the nerve.

The nerve gives off the articular and muscular branches.

Summary

Posterior relation

- (i) Gluteus maximus.
- (ii) Long head of Biceps femoris.

Anterior relation

- (i) Ischium.
- (ii) Nerve to the quadratus femoris.
- (iii) Gemellus superior.
- (iv) Obturator internus.
- (v) Gemellus inferior.
- (vi) Quadratus femoris.
- (vii) Posterior surface of Adductor magnus.

Medial relation

- (i) Semi membranousus.

MEDIAL POPLITEAL NERVE

Q. Describe the medial popliteal (tibial) nerve.

The medial popliteal nerve is the largest terminal branch of the sciatic nerve. Its fibres are derived from the ventral branches of the anterior primary rami of the fourth and fifth lumbar

and the first, second and third sacral nerves. It runs on the back of the thigh and passes through the middle of the popliteal fossa to the distal border of the popliteal muscle. It accompanies the popliteal artery deep to the soleus.

From the distal border of the popliteus muscle the medial popliteal nerve is continuous in the posterior surface of the leg as the posterior tibial nerve.

Relations

The medial popliteal nerve lies deep to the hamstring muscles above and becomes superficial in the popliteal fossa below. In the upper part of the popliteal fossa, the nerve lies lateral to the popliteal vessels. At the knee-joint the nerve becomes superficial to these vessels and it crosses the vessels from the lateral to the medial side and remains on the medial side of the popliteal artery. In the lower part of the popliteal fossa, the nerve is covered by the two heads of the gastrocnemius.

Branches

The following are the branches of the medial popliteal nerve :—

- (i) Articular.
- (ii) Muscular.
- (iii) Sural.

POSTERIOR TIBIAL NERVE

Q Describe the commencement, termination, course, relation and branches of the posterior tibial nerve.

The posterior tibial nerve is the continuation of the medial popliteal nerve. It commences at the lower border of the popliteus muscle and runs along with the posterior tibial vessels to the interval between the heel and the medial malleolus. It then passes behind the flexor retinaculum into the sole of the foot by dividing into the medial and lateral plantar nerves. On the

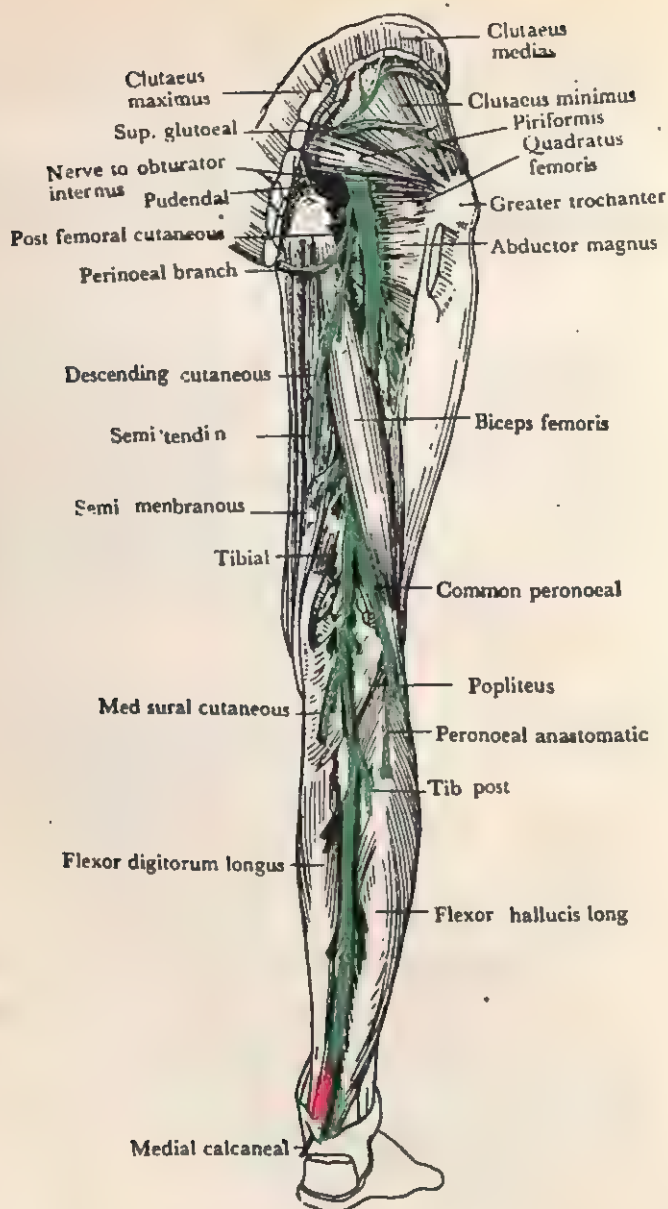


Fig. 72. Nerves of the back of the thigh and leg.

upper part of the posterior surface of the leg, the nerve is covered by the soleus and the gastrocnemius muscles but in the lower part the nerve becomes superficial and is covered by the skin and fasciae.

Above, the posterior tibial nerve lies on the medial side of the posterior tibial vessels, but it soon crosses behind the vessels and runs on the lateral side of the vessels up to the bifurcation of the posterior tibial nerve.

In the upper part of the leg, the nerve lies on the tibialis posterior muscle but in the lower part of the leg it comes in relation with the posterior surface of the tibia.

Branches

The following are the branches of the posterior tibial nerve :

- (i) Articular.
- (ii) Muscular.
- (iii) Medial calcanean.

MEDIAL PLANTAR NERVE

Q. Describe the medial plantar nerve. Mention its branches.

(Agra University, G. H. M. S., 1965)

The medial plantar nerve is the larger of the two terminal branches of the posterior tibial nerve which divides on the posterior aspect of the medial malleolus under cover of the flexor retinaculum. It accompanies the medial plantar artery and lies on the lateral side of the plantar vessels. At its commencement, the nerve lies beneath the flexor retinaculum. As it goes to the sole of the foot, the nerve lies deep to the abductor hallucis. Then it lies between the abductor hallucis and the flexor digitorum brevis with the medial plantar artery lying on the medial side of the nerve. Here it gives off one digital nerve to the medial side of the great toe. It then finally divides into three plantar digital nerves just opposite the bases of the metatarsal bones.

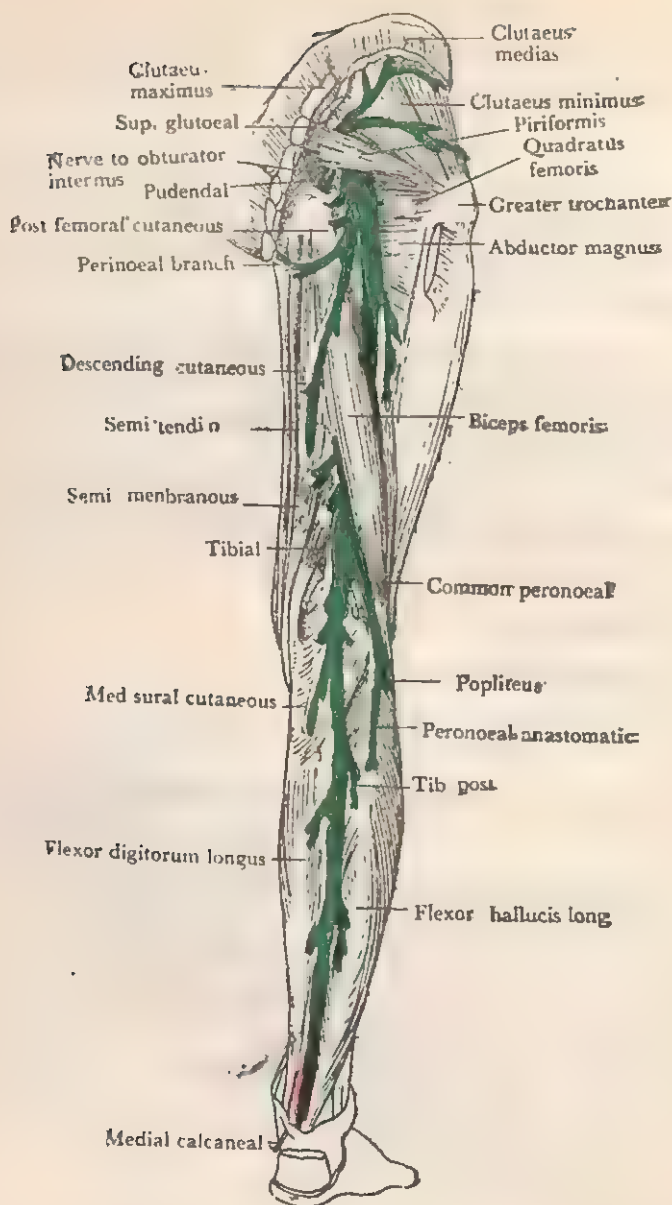


Fig. 73. Nerves of the posterior surface of the leg.

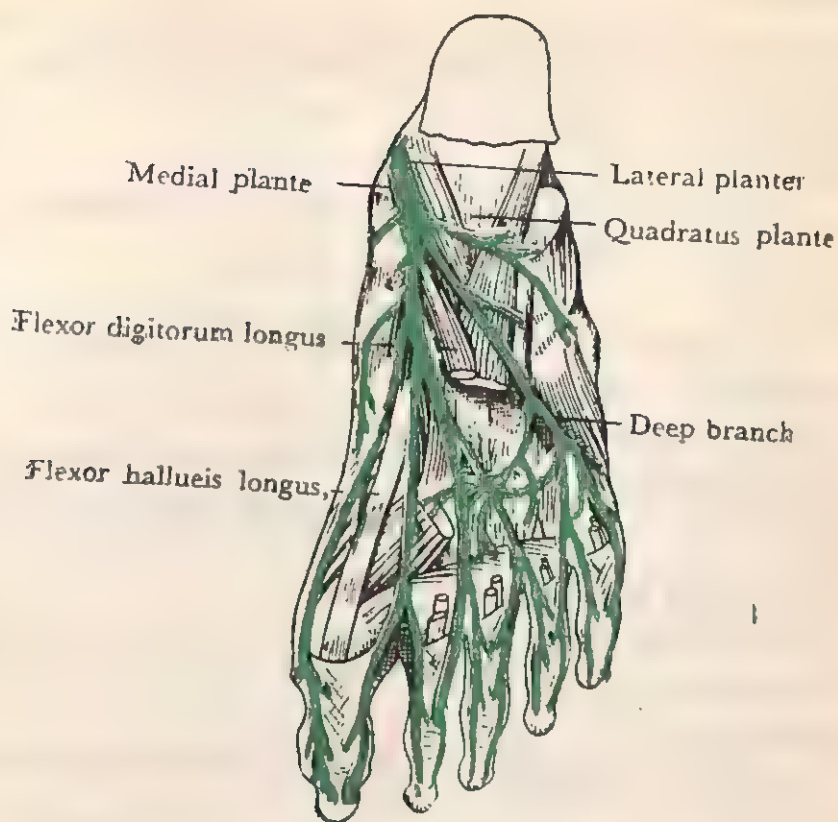


Fig. 74. Nerves of the foot (Plantar aspect)

Branches

The following are the branches of the medial plantar nerve.

- (i) Muscular.
- (ii) Articular.
- (iii) Cutaneous.
- (iv) Digital nerve of the great toe.
- (v) Three plantar digital nerves.

Muscular

The muscular branches supply the abductor hallucis, the flexor digitorum brevis, the flexor hallucis longus and the first lumbrical.

Articular

The articular branches supply the tarsal and transo-metatarsal joints.

Cutaneous

The cutaneous branches supply the skin of the medial side of the sole.

Digital nerve of the great toe

The digital nerve of the great toe is distributed to the flexor hallucis brevis and the skin on the medial side of the great toe.

Three plantar digital nerves

The medial plantar nerve divides into four digital branches from medial to the lateral side of the sole of the foot.

First digital nerve

It supplies the medial side of the great toe and also a branch to the flexor hallucis brevis muscle.

Second digital nerve

It is distributed to the first lumbrical muscle and opposite the cleft between the great toe and the second toe. It divides into two collateral digital nerves which supply the adjacent sides of the great and second toes.

Third digital nerve

Opposite the cleft between the second and third toes, it divides into two collateral branches which supply the adjacent sides of the second and third toes.

Fourth digital nerve

It communicates with the digital branch of the lateral plantar nerve and opposite the cleft between the third and fourth toes.

It divides into two collateral branches which supply the adjacent sides of the third and fourth toes.

The nerves lie superficial to the digital arteries on the sides of the toes. They supply the articular branches to the digital joints and the cutaneous branches to the plantar and dorsal surfaces of the toes. Finally each nerve ends into two branches—one to the nail and the other to the pulp of the toe.

LATERAL PLANTAR NERVE

Q. Describe the lateral plantar nerve

The lateral plantar nerve is one of the two terminal branches of the posterior tibial nerve which divides on the posterior aspect of the medial malleolus beneath the flexor retinaculum. It accompanies the lateral plantar artery which lies on the lateral side of the nerve. At its commencement the nerve lies deep to the flexor retinaculum and then as it passes to the sole of the foot, the nerve lies deep to the abductor hallucis. It then crosses the sole of the foot obliquely and runs towards the base of the fifth metatarsal bone. During its course the nerve lies at first between the flexor digitorum brevis superficially and the flexor digitorum accessorius deep with the lateral-plantar artery lying on the lateral side of the nerve. Then it lies between the flexor digitorum brevis and the abductor digiti minimi. Here it ends by dividing into two branches—superficial and deep.

Superficial branch

The superficial branch is the terminal branch of the lateral plantar nerve. It divides into two plantar digital nerves—lateral and medial.

The lateral plantar digital nerve

It supplies the lateral side of the little toe and also the flexor digiti minimi brevis and the fourth dorsal and third plantar interosseous muscles.

The Medial plantar digital nerve

The medial plantar digital nerve communicates with the third plantar digital branch of the medial plantar nerve and divides into two collateral digital branches which supply the adjacent sides of the fourth and fifth toes.

Deep branch

The deep branch of the lateral plantar nerve crosses the sole of the foot from the lateral to the medial side lying between the third and fourth layers of muscles. The deep branch lies on the bases of the metatarsal bones and the interosseous muscles.

Superficial to the deep branch of the lateral plantar nerve are the oblique head of the adductor hallucis, the flexor tendons and the lumbricals muscles. It accompanies the plantar arch.

Branches

- (i) Muscular : supplies the flexor digitorum accessorius and the abductor digiti minimi.
- (ii) Articular : supplies the calcaneo-cuboid joint.
- (iii) Cutaneous : supplies the skin of the lateral side of the sole of the foot.
- (iv) Two terminal
 - (a) Superficial.
 - (b) Deep.

LATERAL POPLITEAL NERVE

Q. Describe the lateral popliteal nerve from its origin to its termination. Mention its important branches.

The lateral popliteal nerve is another terminal branch of the sciatic nerve. Its fibres are derived from the dorsal branches of the anterior primary rami of the fourth and fifth lumbar and the first and second sacral nerves. It begins at the upper part of the popliteal fossa and runs along the lateral side of the popliteal fossa to the head of the fibula following the medial border of the tendon of the biceps femoris. Here the nerve is situated

between the lateral head of the gastrocnemius and the tendon of the biceps femoris-muscles. It then winds round the neck of the fibula, deep to the peroneus longus muscle and enters the anterior surface of the leg where it ends by dividing into two branches,—anterior tibial (deep peroneal nerve, and musculo-cutaneous (superficial peroneal) nerve.

Branches

The following are the branches of the lateral popliteal nerve :—

- (i) Articular.
- (ii) Cutaneous.
- (iii) Terminal:
 - (a) Anterior tibial.
 - (b) Musculo cutaneous.

Articular branches of the lateral popliteal nerve

They are three in number: Two accompany the superior and inferior lateral genicular arteries. The third known as the recurrent genicular, accompanies the anterior tibial artery.

Cutaneous branches of the lateral popliteal nerve

They are the lateral cutaneous nerve of calf and the sural communicating nerve.

Lateral cutaneous nerve of calf

It supplies the skin on the lateral side of the calf and runs up to the lateral malleolus.

Sural communicating nerve

It runs towards the medial side on the lateral head of the gastrocnemius. It supplies branches to the skin of the calf and joins the sural nerve after piercing the deep fascia of the leg.

ANTERIOR TIBIAL (DEEP PERONEAL) NERVE

Q. Describe the course and relation of the anterior tibial nerve.

The anterior tibial nerve is one of the two terminal branches of the lateral popliteal nerve. It commences at the neck of the fibula lying between the fibula and the proximal portion of the peroneus longus. It then extends vertically downwards deep to the extensor digitorum longus, lying on the anterior surface of the interosseous membrane. Here the nerve comes in relation with the anterior tibial artery in the upper part of the leg and runs distally to the anterior surface of the ankle-joint along with the anterior tibial artery where it divides into two lateral and medial terminal branches.

The anterior tibial nerve lies first on the lateral side of the anterior tibial artery. Then the nerve lies in front of the anterior tibial artery. Again it lies on the lateral side of the artery at the ankle-joint.

Branches

The following are the branches of the anterior tibial nerve :—

- (i) Muscular.
- (ii) Articular.
- (iii) Lateral terminal.
- (iv) Medial terminal.

Muscular branches

They supply the tibialis anterior, the extensor digitorum longus and the peroneus tertius.

Articular branch

It supplies the ankle-joint.

Lateral terminal branch

The lateral terminal branch of the anterior tibial nerve passes across the tarsus and supplies the extensor digitorum brevis and the tarsal joints, the metatarso-phalangeal joints of the second, third and fourth toes.

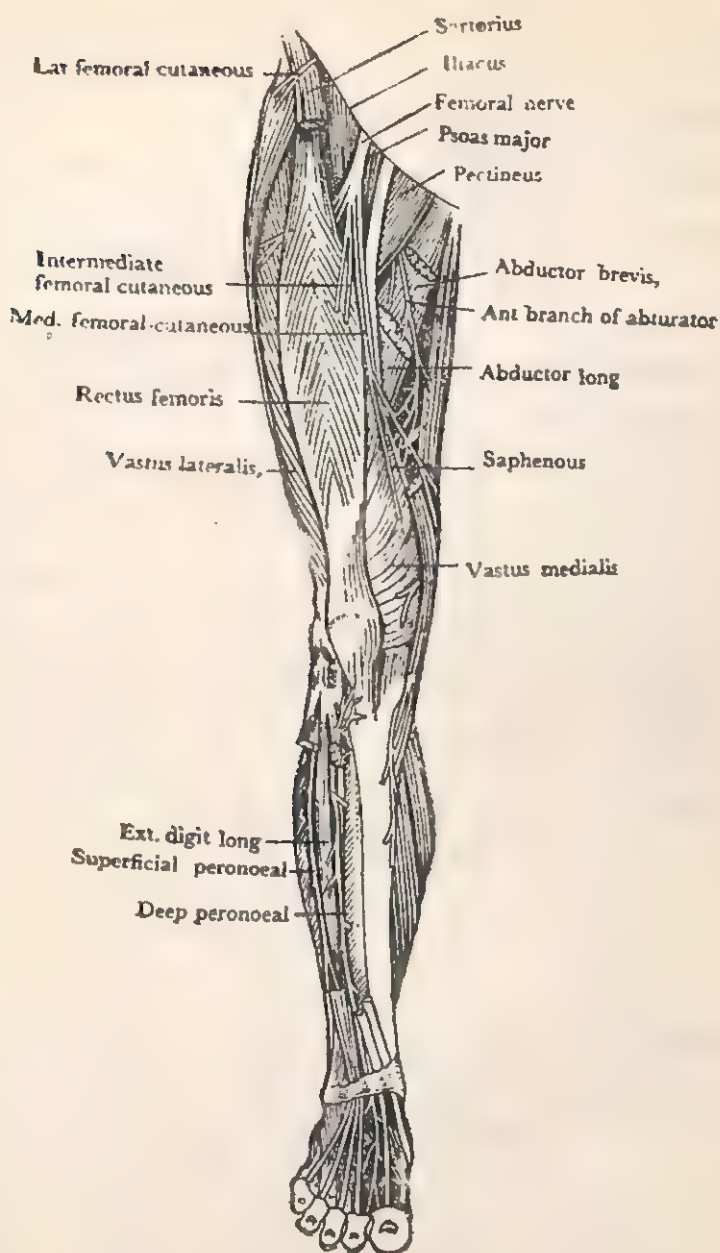


Fig. 71. The nerves of the leg (anterior aspect)

Medial terminal branch

The medial terminal branch of the anterior tibial nerve runs on the dorsum of the foot and lies on the lateral side of the dorsal pedis artery. It divides into two dorsal digital nerves which supply the adjacent sides of the great and second toes. It also supplies the metatarso-phalangeal joint of the great toe.

MUSCULO-CUTANEOUS NERVE (SUPERFICIAL PERONEAL NERVE)

Q. Describe the musculo-cutaneous nerve of the leg (superficial peroneal nerve) from its origin to its termination.

The musculo-cutaneous nerve of the leg is one of the two terminal branches of the lateral popliteal nerve. It begins at the lateral side of the neck of the fibula deep to the peroneus longus.

It then descends downwards on the lateral side of the leg lying first between the peroneus longus and the peroneus brevis. It then runs forwards between the peronei and the extensor digitorum longus and divides into medial and lateral branches after piercing the deep fascia.

Branches

The following are the branches of the musculo-cutaneous (superficial peroneal) nerve:—

- (i) Muscular.
- (ii) Medial.
- (iii) Lateral.

Muscular

The muscular branches supply the peroneus longus and the peroneus brevis and also to the skin of the lower portion of the leg.

Medial branch

It passes in front of the ankle joint and divides into two dorsal digital nerves—one supplies to the medial side of the great

toe and the other supplies the adjacent side of the second and third toes.

Lateral branch

The lateral branch runs along the lateral portion of the dorsum of the foot and divides into two dorsal digital branches which supply the adjacent sides of the third and fourth toes and the fourth and fifth toes. It also supplies the skin on lateral side of the ankle and joins with the sural nerve.

Q. Describe the Posterior Tibial nerve.

The posterior tibial nerve begins at the lower border of the popliteus muscle where it is directly continuous with the medial popliteal nerve. It runs along with the posterior tibial vessels to the interval between the heel and the medial malleolus. It then passes behind the flexor retinaculum into the sole by dividing into the medial and lateral planter nerves. In the upper part the nerve lies deep to the soleus and gastrocnemius but in the lower part the nerve becomes superficial and is simply covered by the skin and the fasciae only. Above, the posterior tibial nerve lies on the medial side of the posterior tibial vessels, but it soon crosses behind the vessels and lies on the lateral side of the vessels upto its bifurcation. In the upper part, the nerve lies on the tibialis posterior muscle, but in the lower part of the leg it comes into relation with the posterior surface of the tibia.

Branches

- (i) Articular branch.
- (ii) Muscular branch.
- (iii) Medial Calcaneal branch.

Q. Describe the Medial Plantar Nerve and mention its branches.

(Agra University, G. H. M. S., 1965)

The medial plantar nerve is the larger of the two terminal divisions of the posterior tibial nerve. It accompanies the medial plantar artery. It lies on the lateral side of the vessels. At first it lies deep to the flexor retinaculum and the abductor hallucis. It then passes between the abductor hallucis and the flexor digi-

torum brevis. Here it gives off one digital nerve to the medial side of the great toe. It then finally divides into three plantar digital nerves just opposite the bases of the metacarpal bones.

Branches

- (i) Calcaneous branch.
- (ii) Muscular branch.
- (iii) Articular branch.
- (iv) Digital nerve of the great toe.
- (v) Three plantar digital nerve.

The three plantar digital nerves split into two branches. The first plantar digital nerve supplies the adjacent sides of the great and the second toes.

The second plantar digital nerve supplies the adjacent sides of the second toe and the third toe.

The third plantar digital nerve supplies the adjacent sides of the third and fourth toes.

The third plantar digital nerve receives a communicating branch from the lateral plantar nerve.

The first plantar digital nerve gives a twig to the first lumbrical muscle.

Each digital branch gives off the cutaneous and articular branches, and opposite the distal phalanx each digital branch gives off a dorsal branch which supplies the structures around the nail.

Q. Describe the course and relation of the Saphenous nerve.

The saphenous nerve is one of the largest branch of the femoral nerve. It lies on the lateral side of the femoral artery upto the apex of the femoral triangle. It then enters the sub-sartorial canal or adductor canal when it crosses the artery superficially from the lateral to the medial side. At the lower end of the canal it leaves the artery by piercing the roof of

the canal and follows the saphenous branch of the descending genicular artery. It descends vertically along the medial side of the knee behind the sartorius. From the knee it runs downwards along the medial side of the leg and divides into two branches which follow the long saphenous vein, a larger branch lying posterior to the vein and the smaller lying anterior to the vein. At the ankle the larger branch runs anterior to the medial malleolus and lies medial side of the foot and runs upto the great toe. It gives off infrapetellar branches which supply the skin on the front of the knee and ends in the petellar plexus. It also supplies the skin on the medial side of the leg and the foot.

Q. Give an account of the extra Pelvic course, distribution and relations of the obturator nerve.

(*Agra University, G. M. H. S. 1964; Lucknow University, 1960*)

The obturator nerve is the branch of the lumbar plexus. It leaves the pelvic cavity by passing through the obturator canal. In the obturator canal it divides into two branches viz. superficial or anterior and deep or posterior.

1. Superficial or Anterior branch:—

The anterior branch leaves the pelvis anterior to the obturator externus and descends in front of the adductor brevis and behind the pectineus and the adductor longus. At the lower border of the adductor longus it communicates with the medial cutaneous nerve and the saphenous nerve branches of the femoral nerve to form a plexus.

It then descends on the femoral artery to which it is finally distributed. It gives a twig to the hip joint.

It also supplies branches to the adductor longus, the gracilis and the adductor brevis.

2. Deep or Posterior division :—

The posterior division of the obturator nerve pierces the obturator externus and supplies this muscle. It then passes behind the adductor brevis and in front of the adductor magnus

Here it divides into branches which supply the adductor brevis and adductor magnus. It also gives a twig to the knee-joint. It then enters the popliteal fossa by perforating the lower part of the adductor magnus and runs upon the popliteal artery to the back of the knee joint and distributes the articular capsule.

It also gives filaments to the popliteal artery.

Q. Describe the course and relation of the Saphenous nerve.

The saphenous nerve is one of the largest cutaneous branches of the femoral nerve. In the lower part of the femoral triangle it lies on the lateral side of the femoral artery and then it enters the adductor (Hunter's) canal with the femoral artery. It then crosses superficially from the lateral to medial side. At the distal end of the adductor canal it escapes and pierces its roof accompanied by the saphenous branch of the descending genicular artery. It descends vertically on the medial side of the knee behind the sartorius muscle. From the knee it runs distally to the medial side of the leg and divides into two branches which accompany the long saphenous vein. The larger branch of the saphenous nerve lies posterior to the vein, whereas the small branch of the saphenous nerve lies anterior to the vein. At the ankle, the larger branch passes in front of the medial malleolus and comes to the medial side of the foot and runs as far as the metatarso phalangeal joint of the great toe. In the adductor canal the saphenous nerve gives a branch to the subsartorial plexus. It also gives an infrapatellar branch at the lower part of the thigh which pierces the sartorius muscle and supplies the skin on the anterior surface of the knee and then joins the patellar plexus.

The saphenous nerve gives branches to the skin of the medial side of the leg and the foot.

The smaller branch runs along the margin of the tibia and ends at the ankle.

Q. What are the cutaneous nerves of the thigh? Describe briefly.

The following are the cutaneous nerves of the thigh—

- (i) Femoral branch of the genito-femoral nerve.
- (ii) Ilio-inguinal nerve.
- (iii) Lateral cutaneous nerve of the thigh.
- (iv) Intermediate cutaneous nerve.
- (v) Medial cutaneous nerve.

Femoral branch of the genito-femoral nerve.

The genito-femoral nerve is a branch of the lumbar plexus. It gives a branch known as the femoral branch which passes behind the inguinal ligament and enters the thigh. It then pierces the lateral wall of the femoral sheath and enters the lateral compartment of the femoral sheath and lies anterior to the femoral artery. It supplies a twig to the artery. It also supplies a twig to the skin of the femoral triangle.

Ilio inguinal nerve.

The ilio-inguinal nerve is a branch of the lumbar plexus. It passes through the superficial inguinal ring along with the spermatic cord in male and round ligament of the uterus in the female and distributes to the skin of the upper and medial part of the thigh. It also supplies the skin over the root of the penis and the upper part of the scrotum in the male and in the female supplies to the skin of the mons pubis and labium majus.

Lateral cutaneous nerve of the thigh.

The lateral cutaneous nerve is also one of the branches of the lumbar plexus. It then passes behind the lateral end of the inguinal ligament and enters the thigh. It divides into branches, anterior and posterior.

The anterior branch passes through the fascia lata and supplies the skin on the lateral side of the thigh up to knee. It also sends a twig to the patellar plexus.

The posterior branch is distributed to the skin of the lateral side of the thigh from the greater trochanter of the femur to the middle of the thigh.

Intermediate cutaneous nerve.

It comes to the thigh as two or three branches after piercing the fascia lata below the inguinal ligament. These branches run vertically along the anterior surface of the thigh and supply the skin as far as the knee. They end in the patellar plexus.

Medial cutaneous nerve.

It is a branch of the femoral nerve. At the first the medial cutaneous nerve lies on the lateral side of the femoral artery and then it crosses the artery superficially from lateral to the medial side at the apex of the femoral triangle. It then divides into two branches, anterior and posterior.

Before the medial cutaneous nerve divides, it gives off branches to the skin of the medial side of the thigh and also in the neighbourhood of the great saphenous vein.

Anterior branch—The anterior branch runs downwards along the sartorius muscle and after perforating the fascia in the middle of the thigh divides into two branches : one supplies the skin on the medial side of the thigh and the knee and the other branch crosses to the lateral side of the patella and joins with the infrapatellar branch of the saphenous nerve.

Posterior branch—The posterior branch the medial cutaneous nerve passes behind the sartorius up to the knee where it pierces the fascia lata and joins with the saphenous nerve. It then runs on the medial side of the leg and supplies its skin. At the lower border of the adductor longus it forms by joining with branches of the saphenous and obturator nerves.

Q. Write short notes on—

1. Patellar plexus.
2. Subsartorial plexus.

1. Patellar plexus—The patellar plexus is formed by the union of the following nerves :—

- (i) Infrapatellar branch of the saphenous nerve.

(ii) Branches of the Intermediæ cutaneous nerve of the thigh.

(iii) Anterior branch of the medial cutaneous nerve of the thigh.

(iv) Branches from the lateral cutaneous nerve of the thigh.

The patellar plexus is situated on the anterior surface of the patella.

2. Subsartorial plexus.

The subsartorial plexus is situated in the subsartorial canal deep to the sartorius in the middle third of the thigh.

The following nerves take part in the formation of the subsartorial plexus.

(i) Branches of the saphenous nerve.

(ii) Posterior division of the medial cutaneous nerve of the thigh.

(iii) Anterior division of the obturator nerve.

From the subsartorial plexus the branches arise and supply the skin in the medial side of the thigh.

Describe the course, relation and branches of the Medial Popliteal (Tibial) nerve.

The medial popliteal nerve is one of the terminal branches of the sciatic nerve. It runs along the back of the thigh and passes through the middle of the popliteal fossa and ends at the lower border of the popliteus muscle, where it is continuous with the posterior tibial nerve. It runs along with the popliteal artery. In the thigh the nerve is over-lapped by the hamstring muscles above. At the lower part it becomes superficial and is lateral to the popliteal vessels. Just opposite the knee-joint the medial popliteal nerve lies superficially to the popliteal vessel and then the nerve crosses the vessels from lateral to the medial side and is to the medial side of the popliteal artery.

Branches

The following are the branches of medial popliteal nerve :—

- (i) Genicular.
- (ii) Cutaneous.
- (iii) Muscular.

The genicular branches are three in number viz. (i) superior medial genicular, (ii) middle genicular. (iii) medial inferior genicular.

(i) The superior medial genicular branch accompanies the medial superior genicular artery,

(ii) The middle genicular branch follows the middle genicular artery.

(iii) The inferior medial genicular branch goes along the inferior medial genicular artery.

Q. Describe the course, relation and branches of the lateral plantar nerve.

The lateral plantar nerve is one of the terminal branches of the posterior tibial nerve. The division takes place on the posterior aspect of the medial malleolus. The lateral plantar nerve accompanies the lateral plantar.

It then runs distally to the medial side of the sole of the foot through the flexor retinaculum under cover of the adductor hallucis. Then the lateral plantar nerve crosses the sole of the foot obliquely from the medial to lateral side to reach the base of the fifth metatarsal bone. At first it lies between the flexor digitorum brevis superficially and the flexor digitorum accessorius deep. The nerve follows the lateral plantar artery which lies on its lateral side. At the end it lies between the flexor digitorum brevis and adductor digitiminimi. Here it divides into two terminal branches, superficial and deep.

(a) The superficial branch divides into two digital nerves, lateral and medial. The lateral digital nerve supplies the lateral side of the fifth toe and also supplies the flexor digitiminimi brevis and the interosseous muscles of the fourth interspace.

The medial digital nerve communicates with the lateral digital branch of the medial plantar nerve. It then divides into two

collateral digital branches which supply the adjacent sides of the fifth and fourth toes.

(b) The deep branch of the lateral plantar nerve follows the lateral plantar artery and crosses the sole from the lateral to the medial side. Superficial to the nerve are the oblique head of the adductor hallucis, the flexor tendons and the lumbracles. Posterior to the nerve are the bases of the metatarsal bones and interosseous muscles. It supplies the second, third and fourth lumbracles, the adductor hallucis and all the interosser except those of the fourth metatarsal space.

The other branches of the lateral plantar nerve are as follows :—

- (i) Muscular
- (ii) Articular
- (iii) Cutaneous

Q. Describe the posterior cutaneous nerve of the thigh (small sciatic nerve.)

The posterior cutaneous nerve of the thigh arises from the sacral plexus. It passes out from the pelvic cavity through the greater sciatic foramen below the piriformis muscle. It then passes distally with the inferior gluteal artery between the greater trochanter and ischial tuberosity lying beneath the gluteus maximus. It then enters the back of the thigh superficial to the hamstring muscles and deep to the fascia lata. At the popliteal space it pierces the deep fascia and follows the small saphenous vein as far as the middle of the leg and terminates on the posterior aspect of the calf. Its terminal twigs join with the sural nerve.

Branches

The branches of the thigh are cutaneous which are distributed to the gluteal region, the perineum, the back of the thigh and the leg.

Q. Describe the course, relation and distribution of the lateral popliteal nerve.
(Lucknow University,)

The lateral popliteal nerve is one of the terminal branch of the sciatic nerve. It runs obliquely along the lateral side of the popliteal fossa and follows the tendon of the biceps femoris muscle to the head of the fibula.

It lies between the tendon of the biceps femoris and the lateral head of the gastrocnemius muscle. It then winds round the neck of the fibula deep to the peroneus longus muscle and gains the anterior surface of the leg, where it ends by dividing into the anterior tibial nerve (deep peroneal nerve) and musculo-cutaneous nerve (superficial peroneal nerve). Before it divides it gives off articular and cutaneous branches.

Branches

- (i) Genicular.
- (ii) Cutaneous.
- (iii) Terminal.

Genicular : The genicular branches are three in number :

- (i) Superior lateral genicular follows the superior lateral genicular artery of the knee.
- (ii) Inferior lateral genicular accompanies the inferior lateral genicular artery of the knee
- (iii) Recurrent genicular accompanies the anterior tibial recurrent artery.

Cutaneous: The cutaneous branches are two in number:

- (i) Lateral cutaneous nerve of the calf.

It supplies the skin on the lateral side of the calf and descend as far as the lateral malleolus.

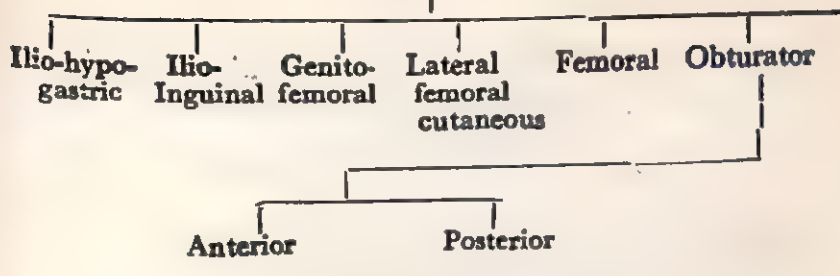
- (ii) Sural cutaneous nerve.

It runs towards the tibial side over the lateral head of the gastrocnemius and supplies branches to the skin of the calf and after piercing the deep fascia it anastomoses with the sural nerve.

Terminal: The terminal branches are the anterior tibial nerve or deep peroneal nerve and the musculo-cutaneous nerve or superficial peroneal nerve.

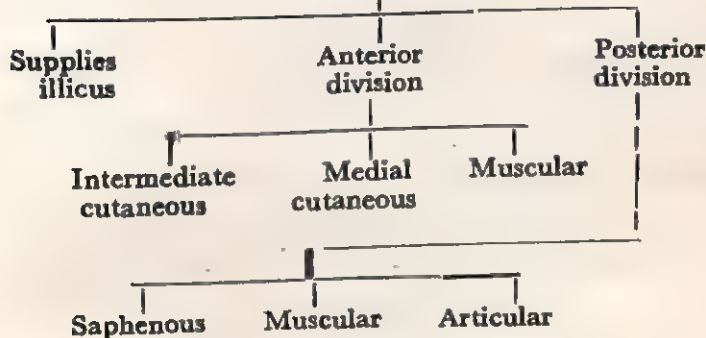
Nerves of the Lower Extremity

Lumbar plexus

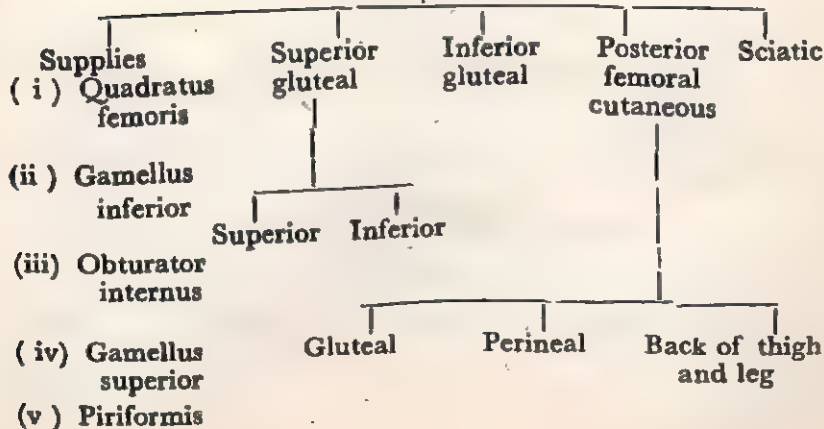


Accessory obturator

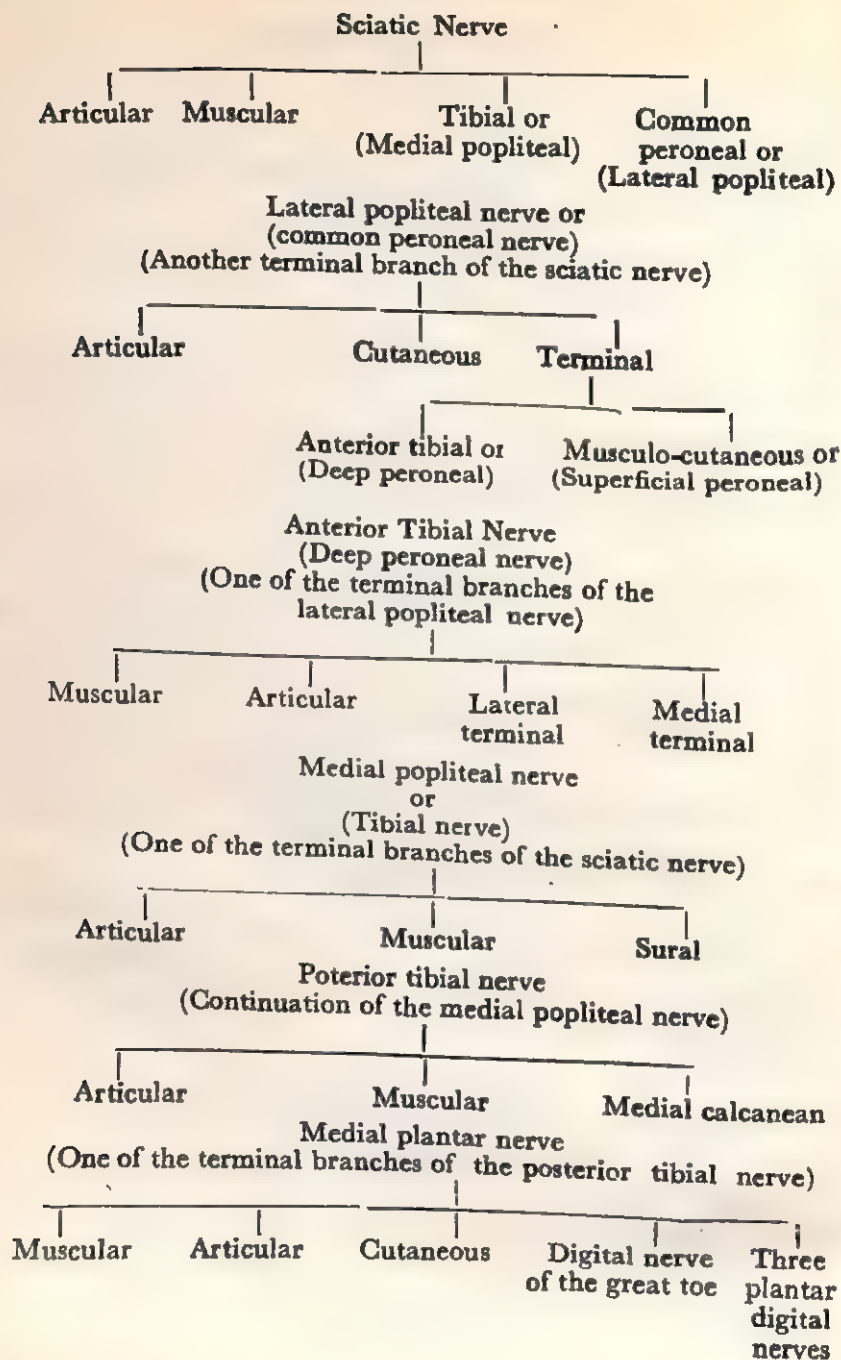
Femoral Nerve



Sacral plexus



EXTREMITIES

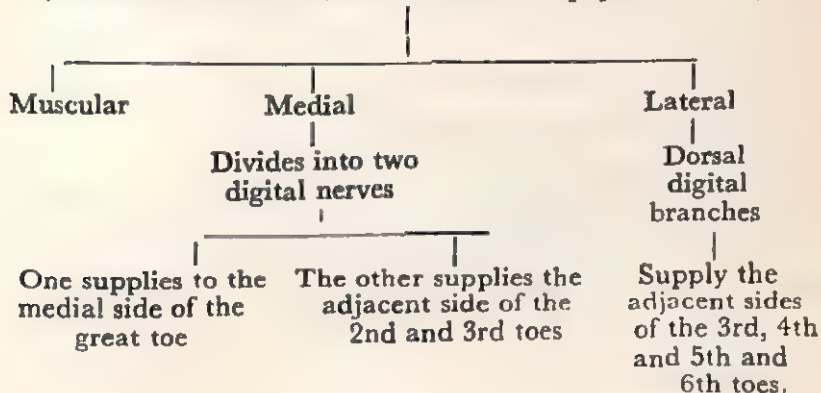


Musculo-Cutaneous Nerve

or

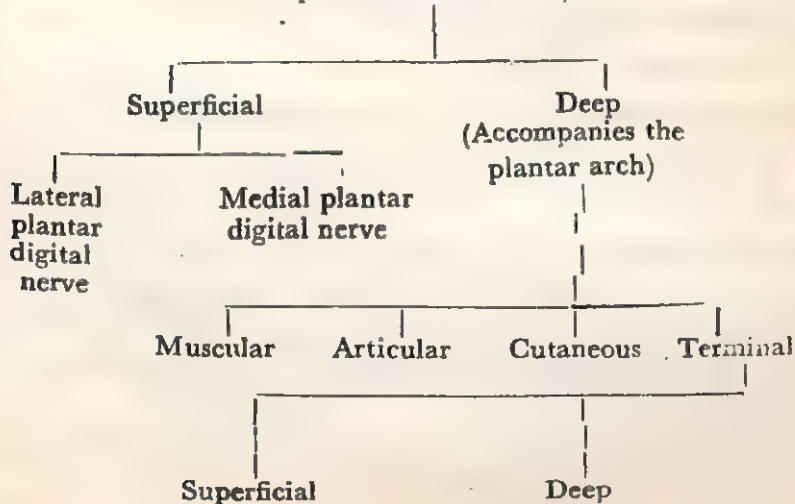
(Superficial peroneal nerve)

(Another terminal branch of the lateral popliteal nerve)



Lateral Plantar Nerve

(One of the two terminal branches of the posterior tibial nerve)



STRUCTURES

Write short notes on :—

- (i) Spring ligament.
- (ii) Interosseous membrane of the forearm.
- (iii) Oblique cord.
- (iv) Bicipital aponeurosis.
- (v) Clavico-pectoral fascia.
- (vi) Axillary fascia.
- (vii) Scapular anastomosis.
- (viii) Pectoral ridge.
- (ix) Teres ridge.
- (x) Spiral groove.
- (xi) Lateral supra-condylar ridge.
- (xii) Cephalic vein.
- (xiii) Deltoid ligament.
- (xiv) Ilio-femoral ligament.
- (xv) Cruciate ligament of knee joint.
- (xvi) Sustentaculum tali.
- (xvii) Syndesmosis.

Spring ligament (plantar calcaneo—navicular ligament)

The spring ligament is situated between the calcaneum and navicular bones. It lies on the medial side of the joint. It is attached posteriorly to the sustentaculum tali of the calcaneum, and anteriorly, it is attached to the plantar surface of the tuberosity of the calcaneum and the dorsal surface of the navicular bone. The tibialis posterior is in relation with the plantar aspect of the ligament.

Some anterior fibres of the deltoid ligament of the ankle joint are attached to the spring ligament.

Interosseous membrane of the forearm

The interosseous membrane of the forearm is a strong membrane lying between the interosseous borders of the shafts of the radius and ulna. It is deficient in its upper part between the two bones. Its fibres are directed downwards towards the ulna. The radial attachment of the upper part of the interosseous membrane is about one inch below the radial tuberosity.

The lower portion of the interosseous membrane is pierced by the terminal branch of the interosseous artery.

Deep muscles of the dorsal and volar groups of the forearm take origin from the interosseous membrane. The fibres of the interosseous membrane are directed in such a way that it reduces the shock of a fall on the outstretched hand by giving part of the weight to the ulna bone.

Relations**Volar relations**

- (i) Flexor digitorum profundus.
- (ii) Flexor pollicis longus.
- (iii) Anterior interosseous vessels and nerve.
- (iv) Pronator quadratus at the distal part of the membrane.

Dorsal relations

From above downwards.

- (i) Supinator.
- (ii) Adductor pollicis longus.
- (iii) Extensor pollicis brevis.
- (iv) Extensor pollicis longus.
- (v) Extensor indicis.
- (vi) Posterior interosseous nerve for a short distance.
- (vii) Posterior branch of the anterior interosseous artery.

Above relation

The posterior interosseous artery.

Below relation

Inferior radio-ulnar joint.

Below, the interosseous membrane is thin and becomes continuous with the fascia of the pronator quadratus.

Oblique cord (Ligament of Weitbrecht or chorda oblique anterior)

The oblique cord is a narrow band and extends from the posterior surface of the radial tuberosity to the ulnar tuberosity. Between the oblique cord and the upper free margin of the interosseous membrane is a triangular space which is bounded on the medial side by the shaft of the ulna. It contains the posterior interosseous artery.

The cord oblique posterior is a band and extends from the ulnar tuberosity to the radial tuberosity. It is situated on the dorsal surface of the interosseous membrane in its upper part and it is in relation with the attachment of the adductor pollicis longus.

Bicipital aponeurosis

The bicipital aponeurosis is a strong band of fibrous tissue. It arises from the medial side of the upper part of the tendon of the biceps brachii and runs distally to the medial side and blends with the deep fascia covering the flexor muscles of the forearm arising from the medial epicondyle of the humerus.

It lies over the brachial artery and the median nerve. Superficial to the band are the median basilic vein and the medial cutaneous nerve of the forearm.

Clavico-pectoral fascia (coraco-clavicular fascia)

The clavico-pectoral fascia is that portion of the deep pectoral fascia which occupies the triangular gap between the upper margin of the pectoralis minor, the subclavius and the apex of the coracoid process.

Above, the fascia divides into two laminae enclosing the subclavius muscle and then these two laminae are attached to the two borders of the subclavian groove for subclavius muscle.

Below, the fascia divides at the upper border of the pectoralis minor enclosing the muscle and at the lower border of the pectoralis minor the two laminae reunite. It then becomes continuous with the axillary fascia which is known as the suspensory ligament of Gerdy.

Laterally, the fascia is attached to the coracoid process.

Medially, it is continuous with the fascia covering the first and second intercostal spaces and is attached to the first costal cartilage.

The clavico-pectoral fascia lies anterior to the axillary vessels.

The fascia is pierced by the cephalic vein, the thoraco-acromial vessels, and the lymphatic vessels.

The upper part of the fascia extends from the coracoid process to the first costal cartilage. It is thick and stronger than the lower portion.

Axillary fascia

The pectoral fascia covering the upper part of the pectoralis major is thin but it becomes thicker in the gap between the pectoralis major and the latissimus dorsi. Here it forms the floor of the axillary space and is known as the axillary fascia. Thus it extends from the anterior to the posterior fold of the axilla and forms the floor of the axillary space. It is in continuation with the deep pectoral fascia anteriorly and posteriorly it blends with the deep fascia covering the latissimus dorsi.

Laterally, it is in continuation with the deep fascia of the arm.

Medially, it is in continuation with the fascia covering the serratus anterior muscle.

The fascia makes an arch with the convexity upwards towards the axilla.

Scapular anastomosis

The scapular anastomosis is divided into two groups—scapular proper and acromial.

Scapular proper

The following are the arteries taking part in anastomosis of the scapular proper :—

(i) Supra-scapular.

(ii) Deep branch of the transverse cervical branch of the subclavian artery.

(iii) Circumflex scapular, a branch of the subscapular artery, which is the branch of the third part of the axillary artery.

The supra-scapular and deep branch of the transverse cervical arteries supply the supra-spinatus and the infraspinatus fossae and the subscapular fossa of the scapula.

The circumflex scapular artery supplies the infra-spinatus fossa and the subscapular fossa.

In the supra-spinatus fossa, the supra-scapular artery anastomoses with the deep branch of the transverse cervical artery.

In the infra-spinatus fossa the suprascapular artery, the deep branch of the transverse cervical artery and the circumflex scapular artery anastomose with one another.

In the subscapular fossa the anterior branches of the supra-scapular and deep branch of the transverse cervical arteries anastomose with anterior branch of the circumflex scapular artery.

At the inferior angle of the scapula the deep branch of the transverse cervical artery anastomoses with the descending branch of the circumflex scapular artery.

Acromial anastomosis

The following arteries take part in anastomosing in the superior surface of the acromion process of the scapula :—

(i) Acromial branch of the supra-scapular artery.

(ii) Branches of the thoraco-acromial artery.

(iii) Filaments from the deep branch of the transverse cervical.

Pectoral ridge

The lateral lip of the bicipital groove is very prominent. It gives insertion to the pectoralis major at its lower portion. It is the upper portion of the anterior border of the shaft of the humerus.

Teres ridge

The medial lip of the bicipital groove is less prominent than the lateral lip. It gives insertion to the teres major to its lower portion. It is the upper portion of the medial border of the shaft of the humerus.

Spiral groove

The spiral groove is situated on the posterior and lateral surfaces of the upper portion of the body of the humerus. It gives passage to the radial nerve and the profunda brachii vessels. It begins from upper-third of the posterior surface of the body of the humerus. It then runs forwards and downwards on the lateral surface of the body of the humerus and ends a little below and behind the apex of the deltoid tuberosity.

In the upper portion of the groove there is a nutrient foramen for the branch of the profunda brachii artery.

In the lower portion of the groove, a small slip of the brachialis muscle is attached.

Lateral to the spiral groove on the posterior surface of the body of the humerus there is a rough surface for the origin of the lateral head of the triceps brachii.

Medial to the spiral groove on the posterior surface of the body of the humerus is the origin of the medial head of the triceps brachii.

Lateral supracondylar ridge

The lateral supracondylar ridge of the humerus is the lateral border extending from the lateral epicondyle to the spiral groove of the humerus. It is sharp and prominent. It gives attachment to the lateral intramuscular septum. Its upper two-thirds

on the anterior surface give origin to the brachio-radialis and the lower one-third gives origin to the extensor carpiradialis longus. Posteriorly, it gives origin to the medial head of the triceps.

Cephalic vein

The cephalic vein begins from the dorsal venous network of the head at its lateral end. It runs upwards along the dorsal surface of the lateral side of the forearm. Then it reaches the front of the forearm by gradually winding round the radial border. While ascending on the volar aspect of the forearm the cephalic vein receives tributaries during its course. Below the front of the elbow it communicates with the basitic vein by the median cubital vein. The cephalic vein then runs upwards in front of the elbow between the brachio radialis and the biceps brachii. Here it crosses the lateral anti brachial cutaneous nerve superficially and then ascends upwards along the lateral border to the biceps brachii. In the upper part of the arm the vein passes between pectoralis major and the deltoideus muscles accompanying by the deltoid branch of the thoraco-acromial artery. Now it pierces the coraco-clavicular fascia and crosses the axillary artery. It terminates in the axillary vein below the clavicle.

One of its tributaries known as the accessory cephalic vein is larger than the others. It runs along the dorsal surface of the lateral side of the forearm and joins the cephalic vein below the elbow.

Deltoid ligament (Medial ligament)

The deltoid ligament is the ligament of the ankle joint. It is also known as the median ligament of the ankle joint. It is thick, quadrilateral and flat. It is attached above to the inferior border of the medial malleolus. The anterior fibres of the deltoid ligament are thin and attached to the navicular bone and the plantar calcaneo-navicular ligament.

The middle fibres of the deltoid ligament are short and attached to the talus and extend up to the tubercle on the poste-

rior surface of the bone. In addition to the above attachments there is a deep band of fibres attaching the tip of the medial malleolus and the medial side of the talus.

Ilio-femoral ligament

The ilio-femoral ligament is the strongest portion of the capsule of the hip joint. Its fibres are arranged vertically over the anterior surface of the hip joint like an inverted Y.

It has two strong bands, superior and inferior.

Superior band

The superior band is attached above to the lower portion of the anterior inferior iliac spine and below it is attached to the upper tubercle on the upper portion of the inter-trochanteric line. It receives tendinous expansion from the gluteus minimas and the rectus femoris.

Inferior band

Above, the inferior band is attached below to the anterior-inferior iliac spine and below, it is attached to the lower tubercle on the lower portion of the inter-trochanteric line. The inferior band runs almost vertically. It is thin and long.

Cruciate ligament of knee joint

The cruciate ligaments of the knee-joints are two in number, anterior and posterior.

These two cruciate ligaments cross each other in such a way that they form a letter X.

Anterior cruciate ligament

The anterior cruciate ligament is attached to a depression anterior to the inter-condyloid eminence of the tibia below. This ligament runs upwards, backwards and lateralwards and is attached to the medial surface of the lateral condyle of the femur.

Posterior cruciate ligament

The posterior cruciate ligament of the knee-joint is attached to the posterior inter-condyloid fossa of the tibia below.

This ligament runs upwards, forwards and medialwards and is attached to the lateral surface of the medial condyle of the femur.

When the knee-joint is fully extended, the cruciate ligaments are stretched. The internal rotation of the knee-joint is checked by the anterior cruciate ligament. During external rotation of the knee-joint, both the cruciate ligaments, anterior and posterior are relaxed as they do not cross at that position of the joint.

Sustentaculum tali

The sustentaculum tali is situated at the antero superior portion of the medial surface of the calcaneum. The sustentaculum tali is concave. Above, it has an articular surface for the articulation with the talus. Below, it has a groove for the flexor hallucis longus.

Anteriorly, it gives attachment to the plantar calcaneo-navicular ligaments and below the ligament a portion of the tibialis posterior is attached. Some fibres of the medial ligament of the ankle-joint are attached to the medial margin of the sustentaculum tali.

Syndesmosis

It is a fibrous joint. In this joint the bones are united by a fibrous membrane or ligament of some thickness. The joint moves very little by twisting or slight stretching. The ligamentum flava of vertebrae, the coraco-clavicular ligament and the interosseous membrane of the leg are its examples.

Joints

Acromio-Clavicular Joint

Q. Describe the acromio-clavicular joint.

The acromio-clavicular joint is a gliding joint. It is formed by the acromial end of the clavicle and the medial border of the acromion process of the scapula.

The following ligaments are attached to the joint :—

- (i) Articular capsule.
- (ii) Acromio-clavicular.
- (iii) Articular disc.
- (iv) Coraco-clavicular.



Articular capsule

The articular capsule is attached to the borders of the articular surfaces. Its upper part is thickened forming acromio-clavicular ligament.

Acromio-clavicular ligament

The thickened upper portion of the articular capsule is known as the acromio-clavicular ligament. It is broad ligament. It extends from the upper portion of the acromial end of the clavicle to the adjoining portion of the acromion process of the scapula.

Articular disc

The articular disc is generally absent but when it is present it is attached to the upper portion of the articular capsule.

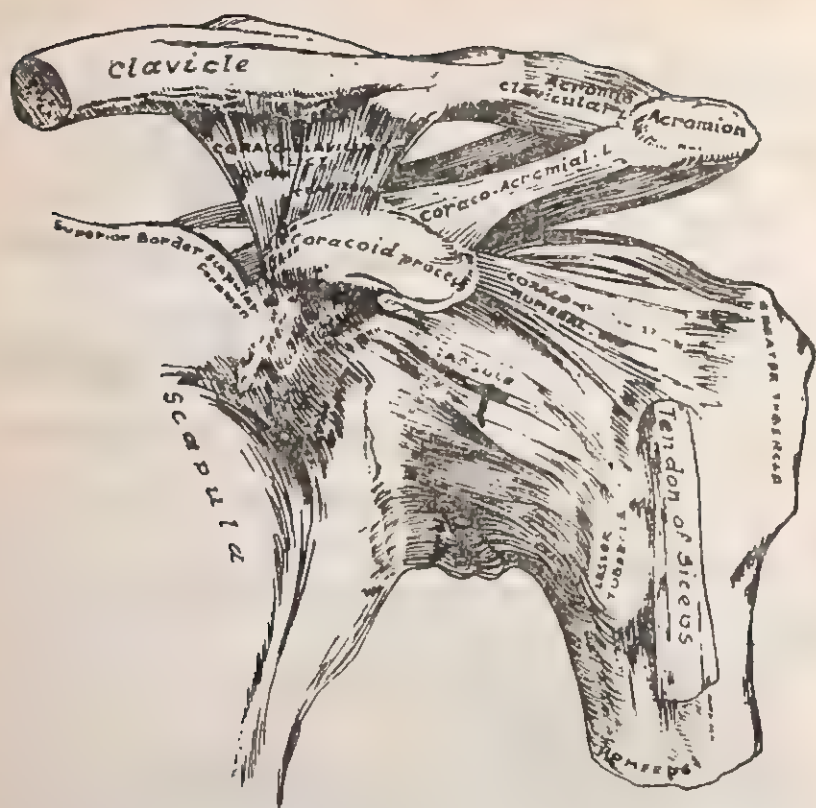


Fig. 1. Showing shoulder and acromio-clavicular joints with ligaments.

Coraco-clavicular ligament

It is a powerful ligament. It connects the lateral portion of the clavicle with the coracoid process of the scapula.

It is divided into two portions viz. the conoid and the trapezoid.

Conoid ligament

The conoid ligament is triangular thick band of fibres. Its apex is attached to the coracoid process of the scapula at the junction of the horizontal and ascending portion of the coracoid process.

The base is attached to the conoid tubercle of the inferior surface of the clavicle.

Trapezoid portion

The trapezoid portion is a broad and thick ligament. It is attached to the trapezoid ridge of the clavicle and to the upper portion of the coracoid process of the scapula.

Q. What are the arteries and nerve supplying the joint ?
 The following arteries and nerve supply the joints :—

Arteries.—(i) Transverse scapular.
 (ii) Thoraco-acromial.

Nerve.—A branch of the supra scapular nerve.

Q. What are the movements of the joint ?

There are two kinds of movements :—

- (i) Gliding motion of the articular end of the clavicle on the acromion.
- (ii) Rotation of the scapula upon the clavicle.

Shoulder Joint

Q. Describe the shoulder joint.

The shoulder joint has a ball and socket appearance (enarthrodial). The bones which take part in the articulation are :—

- (i) **Medially.**—The shallow glenoid cavity of the scapula.
- (ii) **Laterally.**—The hemispherical head of the humerus.

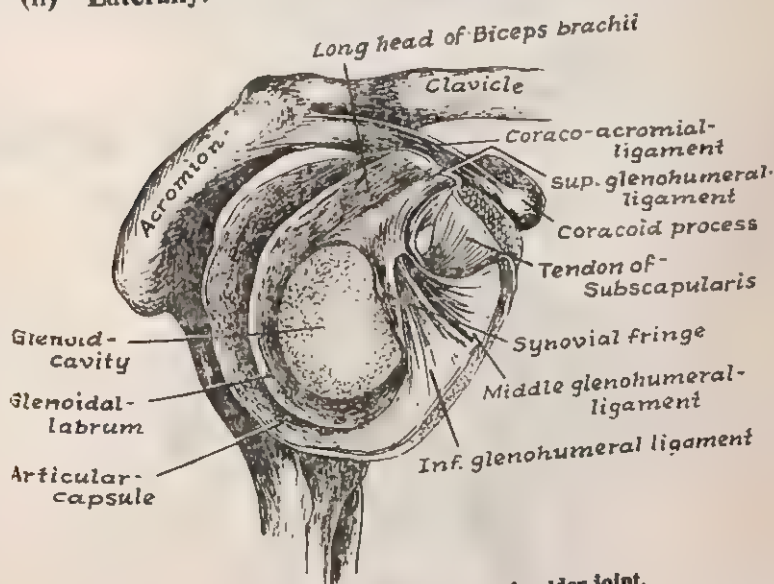


Fig. 2. Showing interior of the shoulder joint.

The articular cartilage which covers the head of the humerus is thick at the centre than at the circumference, whereas the articular cartilage of the glenoid cavity is thin at the centre than at the periphery.

The following are the ligaments of the joint :—

- (i) Articular capsule or capsular ligament.

4 Anatomy

- (ii) Coraco-humeral.
- (lii) Glenoid ligament (Glenoidal labrum).
- (iv) Transverse humeral.

Articular capsule

The articular capsule encloses the joint.

Medially.—It is attached to the circumference of the glenoid cavity of the scapula and to the glenoidal labrum at its margin.

Laterally.—It is attached to the anatomical neck of the humerus, between the head of the humerus medially and the greater and lesser tubercles, laterally.

Superiorly.—It encroaches upto the base of the coracoid process to include the supra glenoid tuberosity and the long head of the biceps.

Inferiorly.—It blends with the scapular origin of the long head of triceps brachii. It is strengthened above by the supraspinatus. Below, it is strengthened by the long head of the triceps brachii. Behind, it is strengthened by the tendon of the infra spinatus and terers minor. In front, it is strengthened by the tendon of the subscapularis.

Synovial membrane

It lines the inner surface of the capsule. It is reflected from the margin of the glenoid cavity of the scapula over the glenoidal

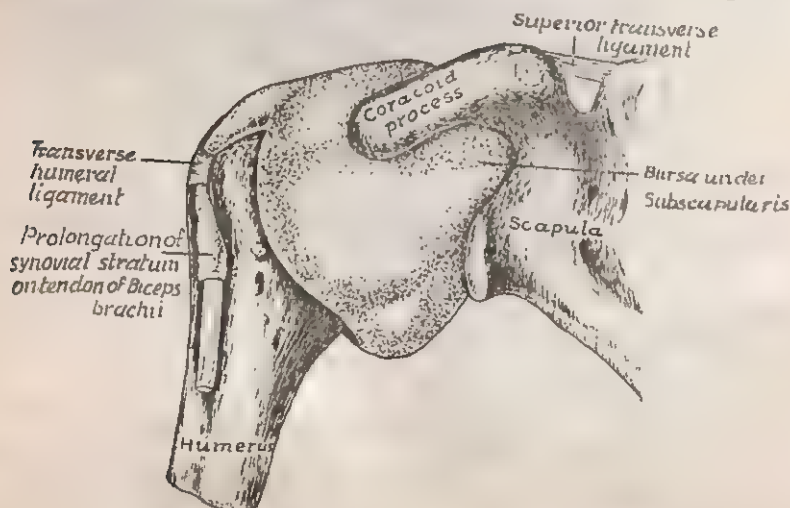


Fig. 3. Showing synovial membrane of the shoulder joint.

labrum. It runs upto the lower portion and sides of the anatomical neck of the humerus as far as the articular cartilage on the head of

the humerus. The tendon of the long head of the biceps^{brachii} passes through the capsule and is enclosed in the tubular sheath of the synovial membrane, which is continued round the inter tubercular sulcus upto surgical neck of the humerus.

Coraco-humeral ligament

It is a strong broad ligament which strenghtens the capsule in the interval between the supraspinatus tendon and subscapularis tendon. It is attached medially to the root of the coracoid process and passes laterally to the front of the greater tubercle of the humerus, where it blends with the tendon of the supraspinatus. The anterior and the upper borders are free. Its posterior border is indistinct.

Transverse humeral ligament

It is broad, thick band which passes from the lesser tubercle to the greater tubercle of the humerus. This ligament converts the inter-tubercular sulcus into a canal through which the tendon of the long head of the biceps brachii passes.

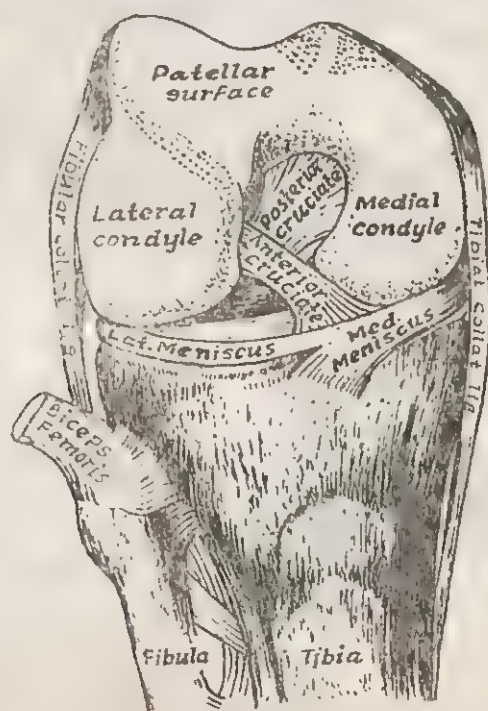


Fig. 4. Showing interior of shoulder joint.

Glenoidal labrum (glenoid ligament)

It is a thick fibro-cartilaginous band which is attached to the

margin of the glenoid cavity of the scapula. This helps to deepen the articular cavity. It is continuous above, with the tendon of the long head of the biceps brachii and below it is attached to the tendon of the long head of the triceps brachii.

Gleno-humeral ligaments

There are three bands of thick fibres *e.g.* superior, middle and inferior.

Superior gleno-humeral ligament

Medially.—It is attached to the adjacent border of the glenoid cavity and also the superior portion of the glenoidal labrum.

Laterally.—It is attached to the fovea capitis of the humerus just above the lesser tubercle where it is mixed with the coracohumeral ligament by transverse fibres.

Middle, gleno-humeral ligament

Medially.—It is attached to the anterior portion of the glenoidal labrum, and the border of the glenoid cavity.

Laterally. It is attached to the distal border of the lesser tubercle of the humerus.

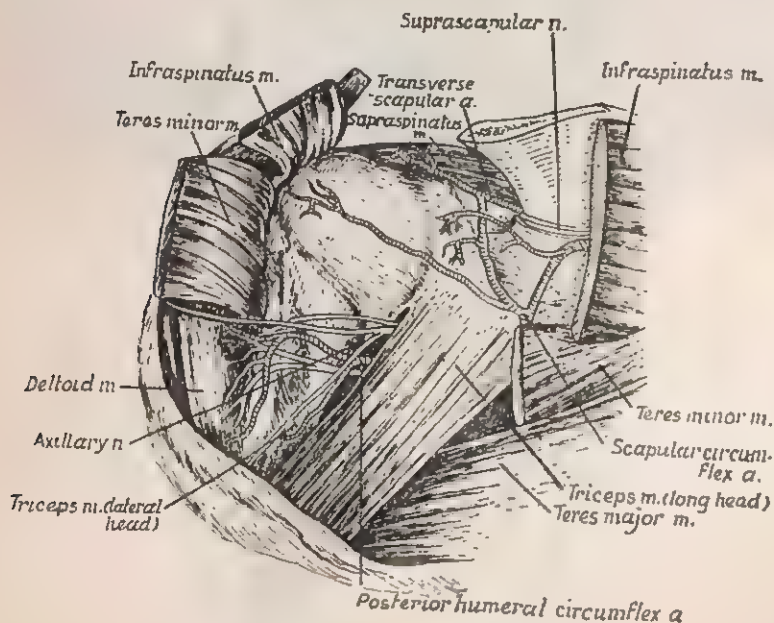


Fig. 5. Showing posterior aspect of shoulder joint.

Inferior gleno-humeral ligament

Medially.—It is attached to the anterior and inferior margin of the glenoid cavity and glenoidal labrum.

Laterally.—It is attached to the medial side of the neck of the humerus.

Q. Describe the arteries and nerve supply of the shoulder joints.

Arteries—The arteries which supply the shoulder joint are derived from the anterior and posterior humeral circumflex and transverse scapular arteries.

Nerve supply

The nerves which supply the shoulder joint are the supra scapular and the Axillary (Circumflex).

Q. Mention the muscular relation of the shoulder joint.

The following muscles are related to the joint :—

Above.—(i) Supra spinatus.

(ii) Deltoideus,

Below.—(i) Long head of the triceps brachii.

(ii) Subscapularis.

Behind.—(i) Infra spinatus.

(ii) Teres minor.

Within.—Tendon of the long head of the biceps brachii.

The Deltoideus muscle covers the shoulder joints all round e. g. in front, behind and laterally.

Q. What are the movements of the shoulder joint ?

As the shoulder joint is an enarthroidal joint (ball and socket joint) it has following movements :—

(i) Flexion.

(ii) Extension.

(iii) Abduction.

(iv) Adduction.

(v) Rotation.

(vi) Circumduction.

Flexion.—In flexion humerus (arm) is carried anteriorly and medially.

Extension.—In extension the humerus (arm) is carried posteriorly and laterally.

Abduction.—In abduction the humerus (arm) is carried not only to the line of the shoulder but can be raised vertically upwards when the arm is carried away from the mid line of the bodies.

Adduction—In adduction the arm is carried towards the mid line.

The abduction and adduction movements take place at right angles to the flexion and extension movements.

Rotation.—In rotation the humerus revolves one quarter of a circle at its own axis.

Circumduction.—In circumduction the succession of the above movements take place. Here the lower end of the humerus is the base of the cone and the apex of the cone is the head of the humerus.

Q. What are the muscles acting on the movement of the shoulder joint ?

The chief muscles that act on the movements of the shoulder joint are as follows :—

(i) Flexion

- (i) Subscapularis.
- (ii) Anterior portion of deltoid.
- (iii) Clavicular origin of the pectoralis major.
- (iv) Coraco brachialis.
- (v) Biceps brachii.

(ii) Extension

- (i) Infra spinatus.
- (ii) Teres minor.
- (iii) Teres major.
- (iv) Latissimus dorsi.
- (v) Long head of triceps brachii.

(iii) Abduction

- (i) Supra spinatus.
- (ii) Deltoideus.

(iv) Adduction

- (i) Subscapularis.
- (ii) Infraspinatus.
- (iii) Teres minor.
- (iv) Pectoralis major.
- (v) Latissimus dorsi.
- (vi) Teres major.
- (vii) Coraco brachialis.
- (viii) Biceps brachii.
- (ix) Triceps brachii.

(v) Rotation inwards

- (i) Subscapularis.
- (ii) Pectoralis major.
- (iii) Latissimus dorsi.
- (iv) Teres major.

(vi) **Rotation outwards**

- (i) Infra spinatus.
- (ii) Teres minor.
- (iii) Posterior fibres of deltoideus.

Elbow Joint

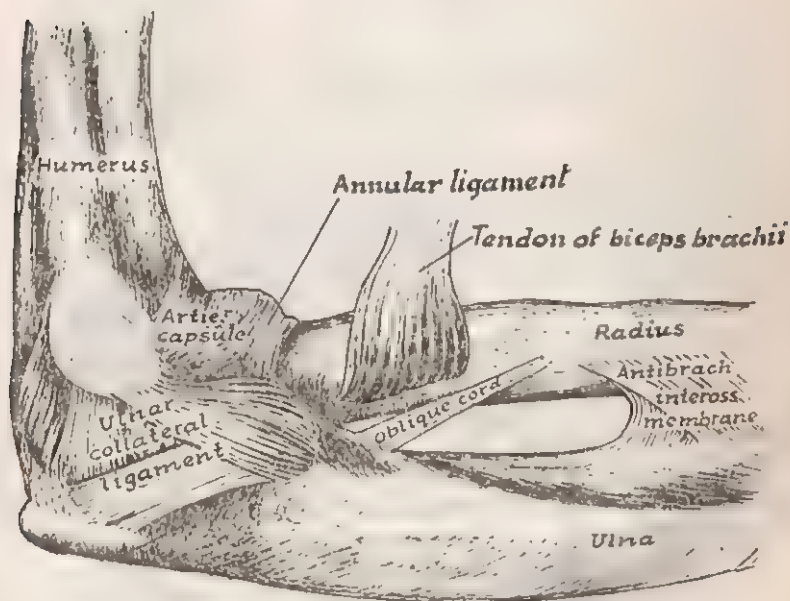


Fig. 6. Elbow joint showing medial aspect.

Q. Describe the elbow joint.

The elbow joint includes three articulations e. g. :—

- (i) Between the trochlea of the humerus and the olecranon process (semilunar notch) of the ulna (Humerolunar).
- (ii) Between the capitulum of the humerus and the cupshaped depression on the head of the radius (Humeroradial).
- (iii) Radio-ulnar. In this the head of the radius articulates with the radial notch of the ulna.

The above three have the same articular capsule.

The humero-ulnar and the humero-radial articulations form the hinge joint (ginglymus joint).

The following ligaments take part in the joint :—

- (i) Articular capsule.
- (ii) Ulnar collateral.
- (iii) Radial collateral.

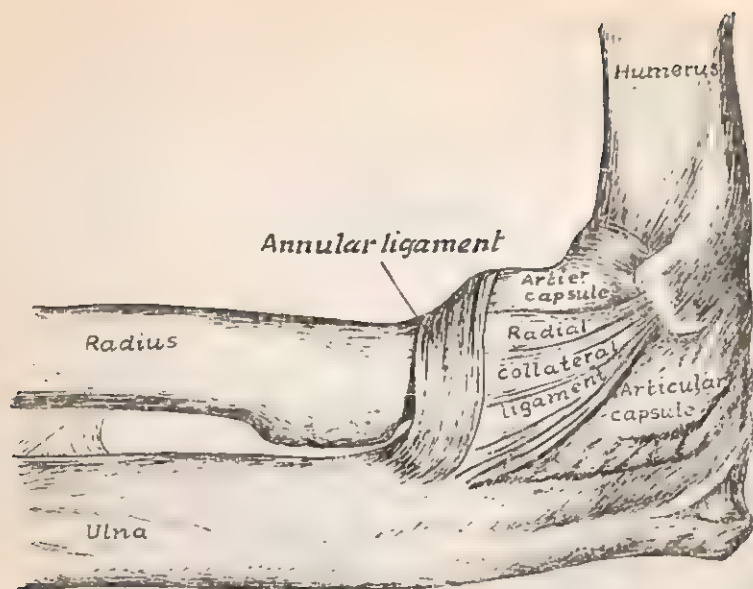


Fig. 7. Elbow joint showing lateral aspect.

Articular capsule

The anterior portion of the articular capsule is a broad and thin fibrous layer, whereas the posterior portion of the articular capsule is thin and membranous.

The anterior portion of the articular capsule is attached above to the infront of the medial epicondyle of the humerus and infront of the humerus just above the radial fossa and coronoid fossa. Below, the articular capsule is attached to the anterior surface of the coronoid process of the ulna and to the annular ligament.

The posterior portion of the articular capsule is attached above to the humerus behind the capitulum near the margins of the trochlea, olecranon fossa and the back of the lateral epicondyle of the humerus.

Below it is attached to the upper and lateral margins of the olecranon process of the ulna and the posterior portion of the annular ligament and also to the ulna behind the radial notch.

Synovial membrane

The synovial membrane lies on the deep surface of the articular capsule. It extends from the margins of the articular surface of the humerus. It also lies on the coronoid fossa, radial fossa and olecranon fossa of the humerus. It is then reflected over the deep surface of the articular capsule and lies on the deep surfaces of the annular ligament and the proximal part of the neck of the radius.

Ulnar collateral ligament

It is a thick triangular ligament. The apex is attached to the

medial epicondyle of the humerus. The base is attached to the medial margin of the trochlear notch of the ulna.

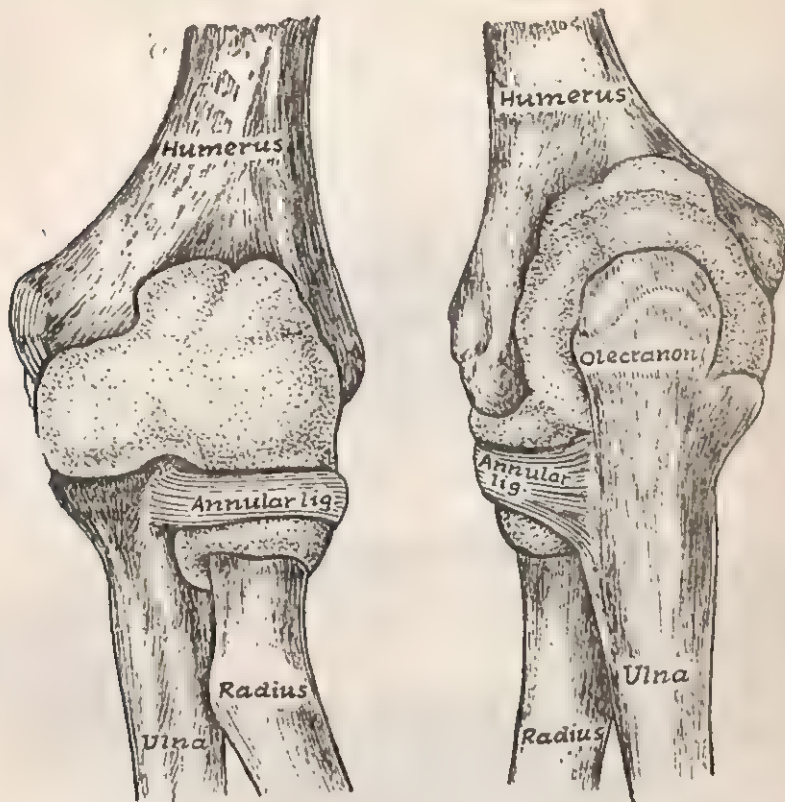


Fig. 8. Synovial stratum of elbow joint. Anterior and posterior aspect.

It consists of three portions e. g. anterior, posterior and medial.

The anterior portion is attached proximally to the anterior aspect of the medial epicondyle of the humerus and the distal portion is attached to the medial margin of the olecranon process.

The posterior portion is attached proximally to the lower and back part of the medial epicondyle of the humerus and distally it is attached to the medial margin of the olecranon process of the ulna.

Middle portion consists of fibres which descend from the medial epicondyle of the humerus to the oblique band (oblique ligament of cooper) which stretches between olecranon process and coronoid process and it converts the depression on the medial margin of the semilunar notch into a foramen.

Ulnar collateral ligament is in relation with the Triceps brachii and flexor carpi ulnaris and the ulnar nerve. It also gives origin to a portion of the flexor digitorum sublimis.

Radial collateral ligament

The radial collateral ligament is attached to the lower portion of the lateral epicondyle of the humerus above and it is attached below to the annular ligament. Some of its posterior fibres are attached to the lateral border of the ulna. These fibres are blended with the origin of the Extensor carpiradiatis brevis and the supinator.

Q. What are the muscles related to the elbow joint? Mention them.

The following muscles are related to the elbow joint :—

Anteriorly.—Brachialis.

Posteriorly.—(i) Triceps brachii.

(ii) Anconacus.

Laterally (Radial side).—(i) Supinator.

(ii) Common tendon of origin of the extensor muscles.

Medially (Ulnar side).—(i) Flexor digitorum sublimis.

(ii) Common tendon of origin of flexor muscles.

Blood And Nerve Supply of Elbow Joint

Q. Describe the arteries and nerve supply of the elbow joint.

Blood supply

The arteries supplying the joint are derived from the plexus formed by the arteria profunda brachii, superior and inferior collateral branches of the brachial artery proximally with the anterior, posterior and interosseous recurrent branches of the ulnar artery and the recurrent branches of the radial artery distally.

These above branches of the arteries form a plexus of anastomotic network around the elbow joint.

Nerve supply

The following are main nerves supplying the joint :—

- (i) Twig from the ulnar nerve.
- (ii) Branch from the musculo-cutaneous nerve.
- (iii) One branch from the radial nerve.
- (v) Two branches from the median nerve.

Movement of Elbow Joint

Q. What are the movements of the elbow joint? Mention the muscles concerned in the movements.

The movements of the elbow joint are (i) Flexion and (ii) Extension.

The following muscles are concerned in the movements of the joint :—

1. **Flexion.**—(i) Biceps.
 (ii) Brachialis.
 (iii) Brachio-radialis.
 (iv) Muscles attached to the medial epicondyle of the humerus.
2. **Extension.**—(i) Triceps.
 (ii) Anconeus.
 (iii) Muscles attached to the lateral epicondyle of the humerus.

Radio-Ulnar Joints

Q. Describe the radio-ulnar joint.

The articulation between radius and ulna is the superior and inferior radio ulna.

The bodies of the radius and ulna are connected together by the interosseous membrane.

Q. Describe the superior radio-ulnar joint.

The articulation is between the circumference of the head of the radius and the osseo-fibrous ring forming the radial notch of the ulna and the annular ligament.

Annular ligament

It is strong fibrous band. It surrounds the head of the radius and retains the radius in contact with the radial notch of the ulna.

Its ends are attached to the anterior and the posterior margins of the radial notch. The circumference of the ligament is small distally than proximally and, therefore, maintains the head of the radius in perfect position.

It gives attachment to ligaments of the elbow joint and the supinator muscle. A thickened band which extends from the inferior border of the annular ligament below the radial notch to the neck of the radius is known as the Quadrate ligament.

Synovial membrane

It is continuous with the synovial membrane of the elbow joint.

It is situated in deep surface of the annular ligament and extends to the proximal portion of the neck of the radius.

Muscular relations

- (i) Extensor carpi radialis brevis.
- (ii) Supinator.

Nerve supply

Radial nerve.

Q. Describe the inferior radio-ulnar joint.

The joint is formed by the articular surface of the head of the ulna and the ulnar notch of the lower end of the radius. The surfaces are covered by the articular capsule and by an articular disc.

Articular capsule

The articular capsule is thick anteriorly and posteriorly. It is loose above and with the synovial membrane it projects upwards as a pouch between the radius and the ulna, i.e. it passes proximally between the interosseous membrane and the pronator Quadratus to form a pouch. The pouch is known as the membrana sacciformis.

Articular disc

The articular disc is triangular in shape. It lies between the ulna and the triquetral.

Its base is attached to the ridge on the radius separating the ulnar notch from the carpal articular surface of the radius. Its apex is attached to a pit between the styloid process and the head of the ulna. It is thick at the volar and dorsal ridges. Its margins are united to the ligaments of the wrist joint. Its proximal surface articulates with the head of the ulna whereas its distal surface articulates with the medial portion of the lunate bone. It also articulates with the triquetral when the hand is adducted. The synovial membrane covers each of its surface.

Nerve supply

The anterior and the posterior interosseous nerves.

The middle radio-ulnar joint

The bodies of the radius and the ulna are connected together by the oblique cord and the anti-branchial interosseous membrane.

Oblique cord

The oblique cord is flat band. It extends from the lateral side of the tubercle of the ulna at the base of the coronoid process of the ulna to the radius a little below the radial tuberosity.

Antibrachial interosseous membrane

It is a strong broad thin sheat of membrane which lies between the interosseous crest of the radius and ulna. The membrane is deficient above a little below the tuberosity of the radius. It is broader in the middle than the upper and lower ends.

There is an oval aperture a little above its lower margin for the passage of the volar interosseous vessels to the back of the forearm.

There is also another gap between its upper border and the obliques cord through which the dorsal interosseous vessels pass.

Muscular Relation

Volar aspect

(i) Flexor digitorum profundus on the ulnar side.

(ii) Flexor Pollicis longus on the radial side.

Between the above two muscles are the volar interosseous vessels and nerve.

(iii) Pronator Quadratus lies on the volar surface of its lower one-fourth.

Dorsal aspect

From proximal to the distal the following muscles are in relation to :—

(i) Supinator,

(ii) Abductor pollicis longus,

(iii) Extensor pollicis brevis,

(iv) Extensor pollicis longus,

(v) Extensor Indicis,

and near the wrist with the posterior branch of the volar interosseous artery and dorsal interosseous nerve.

Q. What are the muscles acting on the humero-ulnar joint and the humero-radial joint ?

The following muscles act on the humero ulnar and humero-radial joints :—

1. Flexion

(i) Brachialis.

(ii) Brachio-radialis.

(iii) Biceps brachii.

(iv) Pronator teres.

2. Extension

(i) Triceps brachii.

(ii) Anconaeus.

Q. What are the muscles acting on the radio-ulnar joint ?

The following muscles act on the radio-ulnar joint :—

(1) Pronation

(i) Pronator teres.

(ii) Pronator Quadratus.

(2) Supination

(i) Supinator.

(ii) Biceps brachii.

Pronation

In pronation, the distal portion of the radius carrying the hand with it crosses over the distal portion of the ulna in such a way that the radius lies on the medial side of the ulna and the palm of the hand looks downwards and the dorsum of the hand is directed upwards.

Supination

In supination the distal portion of the radius and the hand move in opposite direction so that the lower portion of the radius lies lateral and parallel with the ulna and the palm of the hand is directed upwards and the dorsum of the hand looks downwards.

Q. Mention the relations of the interosseous membrane of the forearm.

The relations of the interosseous membrane of the forearm are in the following order :—

Volar aspect of the interosseous membrane of the forearm

- (i) Flexor digitorum profundus on ulnar side.
- (ii) Flexor pollicis longus on the radial side.
- (iii) Volar interosseous vessels and nerve lie in between the flexor digitorum profundus and flexor pollicis longus.
- (iv) Pronator Quadratus lies at its distal portion.

Dorsal aspect of the interosseous membrane of the forearm

From proximal to distal :—

- (i) Supinator.
- (ii) Abductor pollicis longus.
- (iii) Extensor pollicis brevis.
- (iv) Extensor pollicis longus.
- (v) Extensor indicis.
- (vi) Posterior interosseous nerve and the posterior branch of the volar interosseous artery.

Proximal.—The posterior interosseous artery runs backwards to the extensor side of the forearm.

Distal—The interosseous membrane becomes thin and joins the fascia of the Pronator Quadratus on its dorsal surface.

Radio-Carpal or Wrist Joint

Q. Describe the radio-carpal or wrist joint.

The radio-carpal or wrist joint is condyloid. It is formed by the carpal surface of the radius and the articular disc above and the upper surface of the navicular, lunate and triquetral bones with interosseous ligament between them below.

The carpal surface of the radius together with the articular disc form a concave surface into which articular smooth convex surfaces

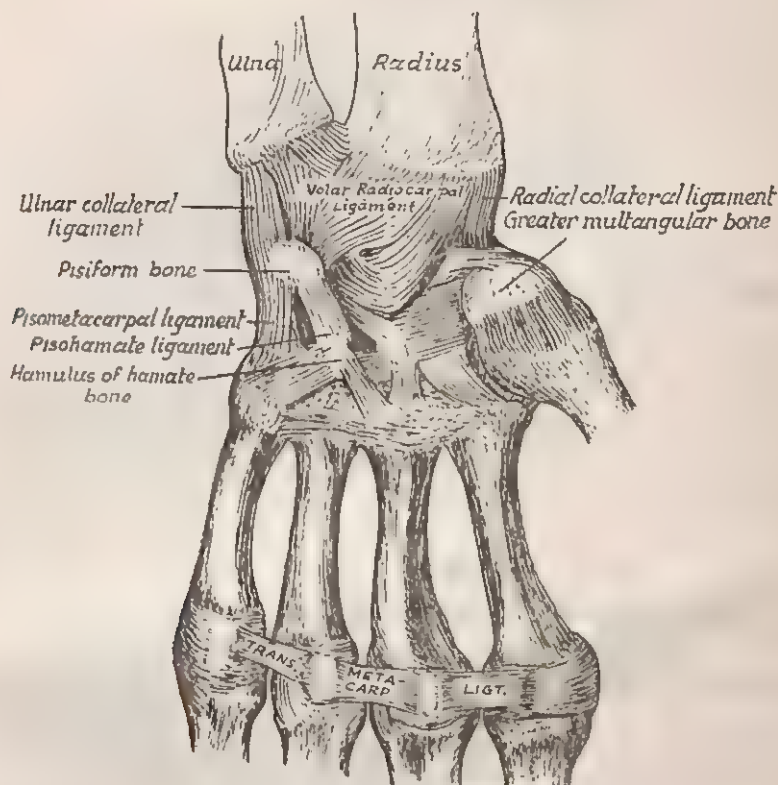


Fig. 9. Showing ligaments of wrist.

of the navicular, lunate and triquetral bones forming the condyle is received. The joint is surrounded by articular capsule to which the under mentioned ligaments are attached e.g. :—

- (i) Volar and dorsal radio-carpal.
- (ii) ulnar and radial collateral.

Volar radio-carpal ligament

It is thick broad ligament which is attached proximally to the anterior border of the distal end of the radius and its styloid process and also to the distal end of the ulna. Distally it is attached to the volar surface of the navicular lunate and triquetral bones and sometimes to the capitate bone for the passage of blood vessels which is perforated.

Relation with the above ligament

- Front.**—(i) Tendon of the flexor digitorum profundus.
(ii) Flexor pollicis longus.

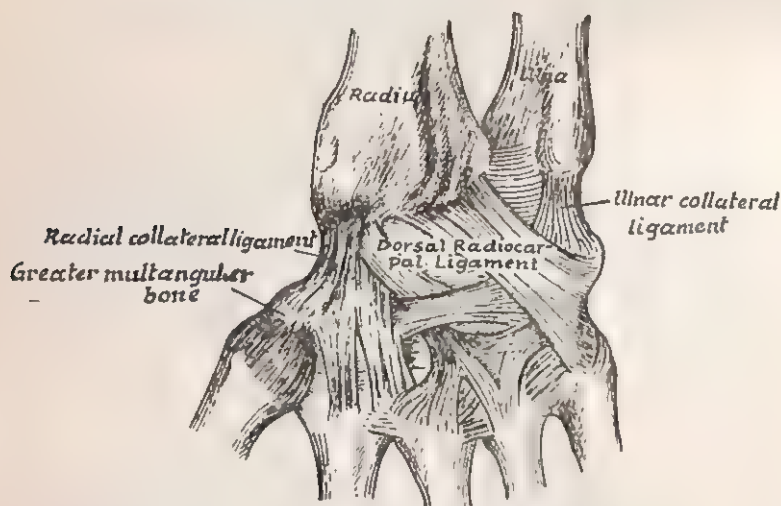


Fig. 10. Showing ligaments of the wrist joint.

Behind.—Adherent to the articular disc of the distal radio-ulnar joint.

Dorsal radio-carpal ligament

It is also broad and thick ligament. It is attached proximally to the posterior border of the distal end of the radius. Distally it is attached to the dorsal surfaces of the navicular, lunate and triquetrum bones and is also continuous with the dorsal inter-carpal ligament.

Relation with the above ligament

Behind.—Extensor tendons of the fingers.

Front.—Blended with articular disc of the distal radio-ulnar joint.

Ulnar collateral ligament

The ulnar collateral ligament is attached to the tip of the styloid process of the ulna proximally and it divides distally into two fasciculi—one is attached to the triquetrum bone and the other is attached to the pisiform bone.

Radio collateral ligament

It is a strong band which extends from the tip of the styloid process of the radius to the tubercle of the navicular bone. Some fibres extend to the greater multangular bone.

Relation with the ligament

Radial artery separates the ligament from the tendons of two muscles e.g. :—

- (i) Abductor pollicis longus.
- (ii) Extensor pollicis brevis.

Synovial membrane

It lines the deep surface of the articular capsule.

Q. What are the movements of the wrist joint ?

The following are the different movements of the wrist joint :—

- (i) Flexion.
- (ii) Extension.
- (iii) Abduction.
- (iv) Adduction.

Q. What are the muscular relations of the wrist joint ?

The following are the muscular relations of the wrist joint :—

Volar.—From ulnar to radial side :—

- (i) Flexor carpi ulnaries.
- (ii) Flexor digitorum profundus.
- (iii) Flexor pollicis longus.
- (iv) Flexor carpi radialis.

Dorsal.—From ulnar to radial side :—

- (i) Extensor carpi ulnaris.
- (ii) Extensor digiti minimi.
- (iii) Extensor digitorum.
- (iv) Extensor Indicis.
- (v) Extensor pollicis longus.
- (vi) Extensor carpi radialis brevis.
- (vii) Extensor carpi radialis longus.

Radial side

- (i) Abductor pollicis longus.
- (ii) Extensor pollicis brevis.

Q. What are the nerve supply of the wrist joint ?

The following nerves supply the wrist joints :—

- (i) Median nerve.
- (ii) Ulnar nerve.
- (iii) Posterior interosseous nerve.

Q. What are the muscles which produce the movements of the wrist joint ?

The following are the muscles which produce the movements of h wrist joint :—

- Flexion.**—(i) Flexor carpi radialis.
(ii) Flexor carpi ulnaris.
(iii) Palmaris longus.
(iv) Flexor digitorum sublimis.
(v) Flexor digitorum profundus.
(vi) Flexor pollicis longus.
- Extension.**—(i) Extensor carpi radialis longus.
(ii) Extensor carpi radialis brevis.
(iii) Extensor carpi ulnaris.
(iv) Extensor digitorum.
(v) Extensor pollicis longus.
(vi) Extensor pollicis brevis.
(vii) Extensor Indicis.
(viii) Extensor digiti minimi.
- Adduction.**—(i) Flexor carpi ulnaris.
(ii) Extensor carpi ulnaris.
- Abduction.**—(i) Abductor pollicis longus.
(ii) Extensor pollicis longus.
(iii) Extensor pollicis brevis.
(iv) Extensor carpi radialis longus.

Sacro-Iliac Joint

Q. Describe briefly the sacro-iliac joint.

The sacro-iliac joint is formed by the auricular surface of the sacrum and the auricular surface of the ilium. A thin plate of cartilage covers the articular surface of each bone. This cartilage is thicker on the sacrum side than the ilium side.

The following are the ligaments of the joint :—

- (i) Anterior (Ventral) sacro-iliac.
- (ii) Posterior (Dorsal) sacro-iliac.
- (iii) Interosseous.

Anterior (ventral) sacro-iliac ligament

The anterior (Ventral) sacro-iliac ligament consists of a large number of thin band of fibres. They are attached on the anterior surface of the lateral portion of the sacrum and on the border of the auricular surface of the ilium and preauricular sulcus.

Posterior (dorsal) sacro-iliac ligament

The posterior sacro-iliac ligament consists of numerous band of fibres lying in the depression between the sacrum and the ilium. Its superior portion are known as short posterior sacro-iliac ligament

which extends from the 1st and 2nd transverse tubercles on the dorsum of the sacrum to the tubersity of the ilium.

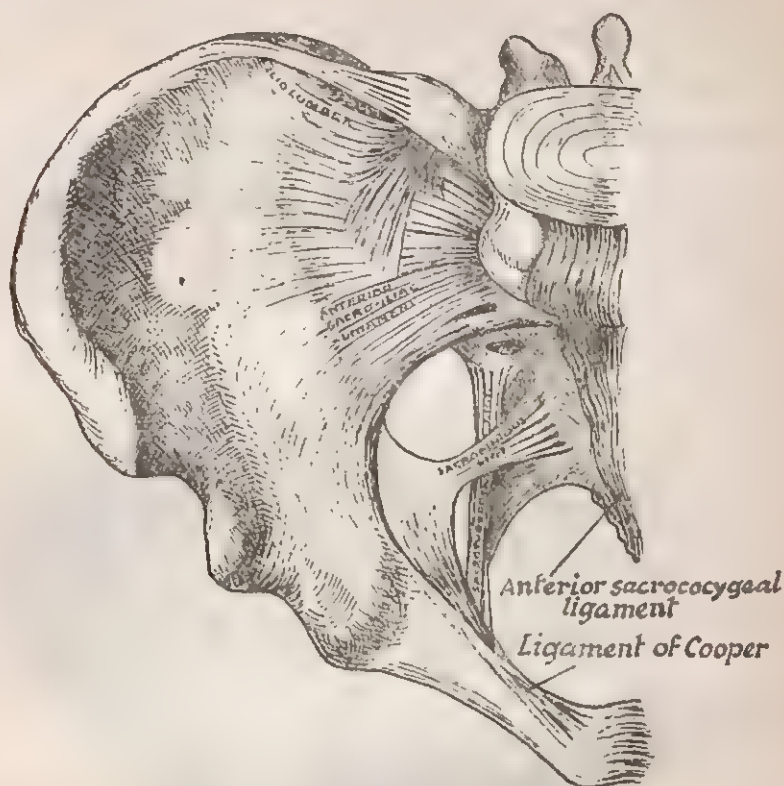


Fig. 11. Sacro-iliac joint showing ligaments.

Its inferior portion is known as the long posterior sacro-iliac ligament. Its upper portion is attached to the 3rd transverse tubercle of the dorsum of the sacrum.

Its lower portion is attached to the posterior iliac spine of the ilium where it intermingles with the upper portion of the sacro-tuberous ligament. It is oblique in direction.

Interosseous sacro-iliac ligament

The interosseous sacro-iliac ligament connects the tuberosities of sacrum and ilium. It is situated deep to the posterior (dorsal) sacro-iliac ligament.

Ligaments connecting the sacrum and ischium

The following ligaments connect the sacrum and ischium :—

- (i) Sacro-tuberous.
- (ii) Sacro-spinous.

Sacro-tuberous ligament

The sacro-tuberous ligament is a strong fan shaped ligament. It extends from the posterior inferior iliac spine, the 4th and 5th transverse tubercles of the sacrum, the lower portion of the lateral border of the sacrum and coccyx to the inner border of the tuberosity of the ischium.

Sacro-spinous ligament

The sacro-spinous ligament is a triangular thin ligament. Its apex is attached to the spine of the ischium.

The base is attached to the lateral borders of the sacrum and coccyx. It is hidden by the sacro-tuberous ligament on its medial portion.

These above two ligaments (sacro-tuberous and sacro-spinous)

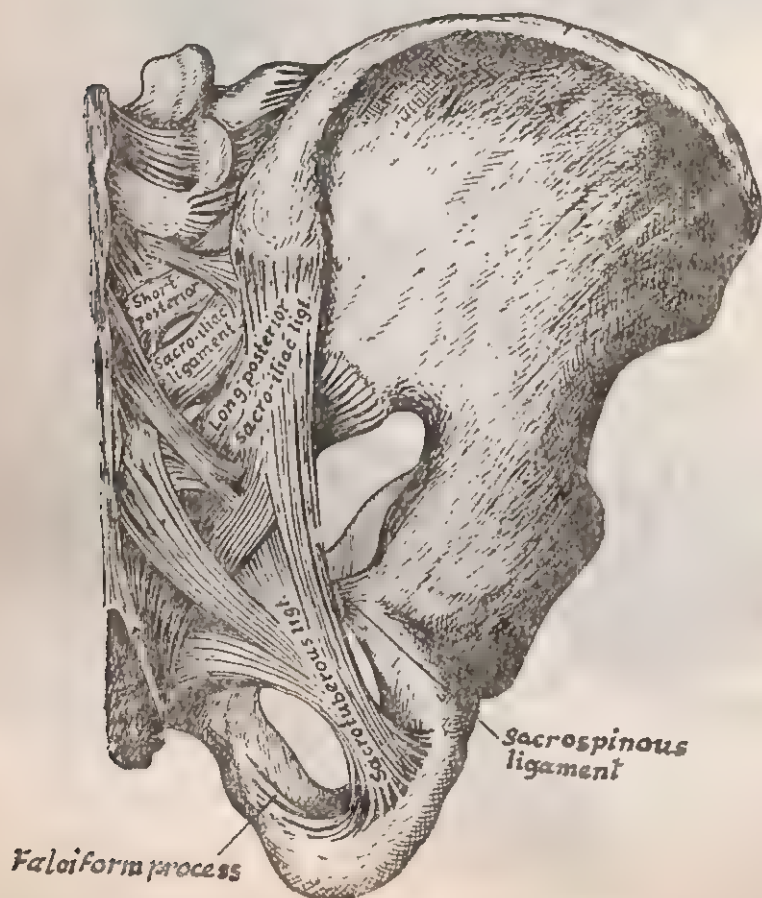


Fig. 12. Sacro-iliac joint, showing ligaments.

convert the sciatic notches into two foramina viz. greater sciatic foramen and the lesser sciatic foramen.

Greater sciatic foramen

The greater sciatic foramen is bounded anteriorly and above by the greater sciatic notch. Behind, by the sacro-tuberous ligament. Below, by the sacro spinous ligament and the spine of the ilium. The piriformis muscle comes out of the pelvis through this foramen.

The following structures pass out of the pelvis above the piriformis muscle.

Superior gluteal vessels and nerve.

Below the piriformis the following structures come out from the pelvis :—

- (i) Inferior gluteal vessels and nerve.
- (ii) Internal pudendal vessels and nerve.
- (iii) Sciatic nerve.
- (iv) Posterior femoral cutaneous nerve.
- (v) Nerves to the obturator internus and Quadratus femoris.

Lesser sciatic foramen

The lesser sciatic foramen is bounded in front by the superior ramus of the ischium. Above, by the spine of ischium and sacro-spinous ligament. Behind, by the sacro-tuberous ligament.

It transmits the following structures :—

- (i) Tendon of the obturator internus.
- (ii) Nerve to the obturator internus.
- (iii) Internal pudendal vessels and nerve.

Hip Joint

Q. Describe the hip joint.

The hip joint has a ball and socket appearance. It is formed by the head of the femur into the cup-shaped cavity of the acetabulum of the hip bone.

The articular cartilage covers the whole surface of the head of the femur except the fovea capitis femoris to which the ligamentum capitis (ligamentum teres) is attached. Within the lunate surface of the acetabulum, there is a circular depression known as the fossa acetabuli which is devoid of cartilage but occupied by a mass of fat covered by synovial membrane.

The following are the ligaments of the joint :—

1. Articular capsule.
2. Iliofemoral.
3. Ischio femoral.
4. Pubo femoral.

5. Ligamentum capitis or teres femoris.
6. Acetabular labrum (Glenoidal labrum).
7. Transverse acetabular or transverse ligament.

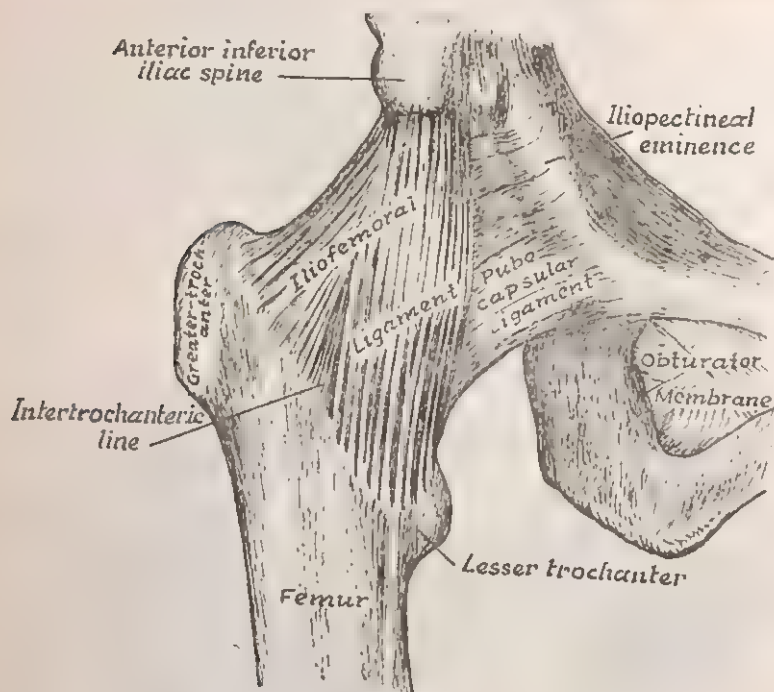


Fig. 13. Hip Joint showing anterior aspect.

Articular capsule

The articular capsule is dense and strong, which is attached to the margin of the acetabulum of the hip bone, a little beyond the acetabular labrum.

Its attachments to the hip bone are as follows :—

Anteriorly.—The articular capsule is attached to the outer margin of the acetabular labrum (Glenoidal labrum).

Posteriorly.—The capsule is attached to the margin of the acetabulum a little beyond the acetabulum labrum.

Inferiorly.—It is attached to the transverse acetabulum ligament as a bridge across the acetabular notch and the edge of the obturator foramen.

Its femoral attachments are as follows :—

It surrounds the neck of the femur neck.

Anteriorly.—It is attached to the intertrochanteric line.

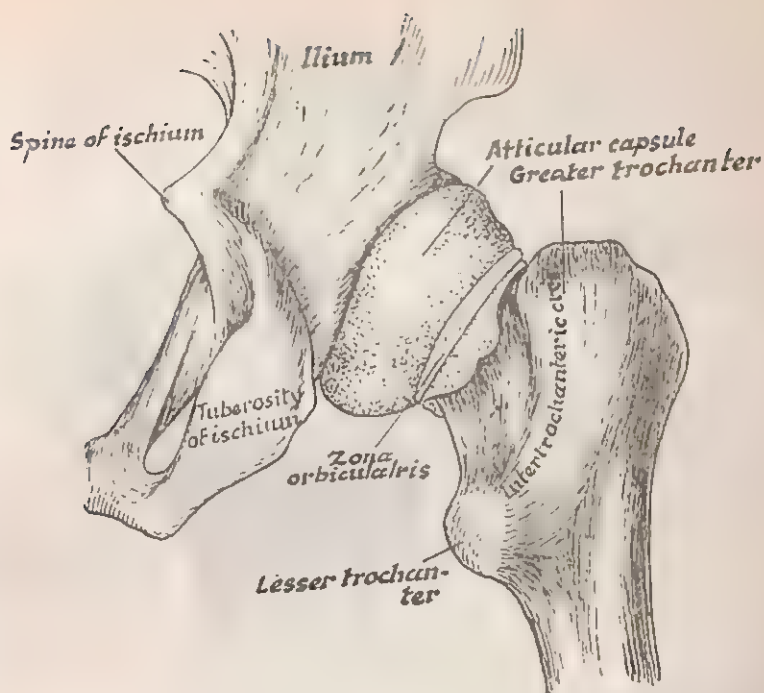


Fig. 14. Showing articular capsule of the hip joint.

Posteriorly.—It is attached to the neck—a little above the intertrochanteric crest.

Above.—It is attached to the base of the neck.

Below.—It is attached to the lower portion of the neck, near the lesser trochanter.

The articular capsule is thicker and stronger in its upper portion than in its below and behind portions where it is thin and loose. The articular capsule is strengthened by the ilio femoral, ischio femoral and pubo femoral ligaments. Numerous muscles cover the capsule which is separated anteriorly from Psoas major and Iliacus muscles by a bursa.

Ilio-femoral ligament.—(Y-ligament or ligament of Bigelow).

It is a triangular ligament. It is situated in front of the joint and connected with the capsule. Its apex is attached to the lower portion of the anterior inferior iliac spine. Its base is attached to the intertrochanteric line of the femur. The ilio femoral ligament is also known as the Y-shaped ligament of Bigelow. Its medial and lateral portions are strong whereas the central portion is thin and weak.

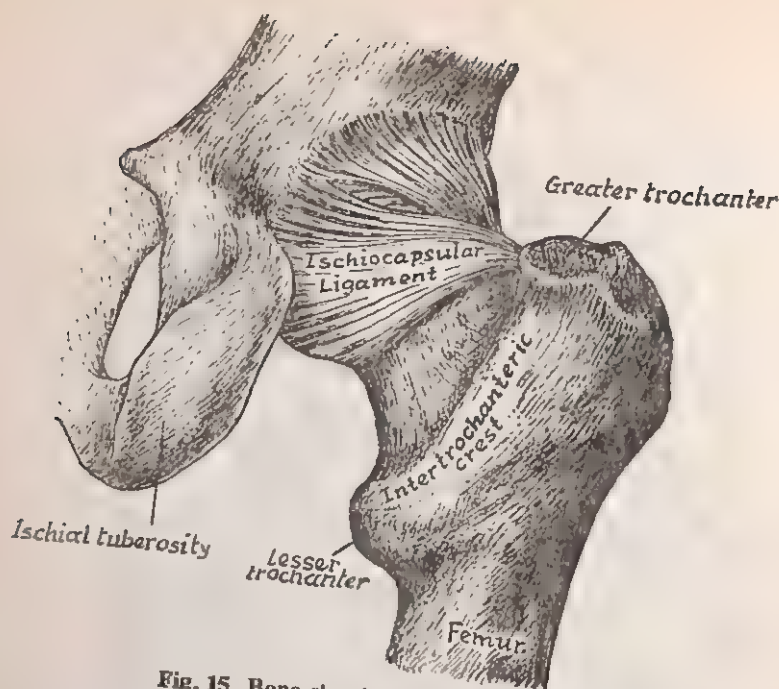


Fig. 15. Bone showing posterior aspect.

Ischio femoral ligament

It is a triangular ligament on the posterior side of the joint. The base of the ligament is attached to the ischium distal and posterior to the acetabulum and blended with the fibres of the capsule. The ligament passes from the ischial attachment and crosses the back of the neck of femur and attaches itself to the medial aspect of the greater trochanter of the femur near the trochantric fossa where obturator internus and gemelli are inserted.

Pubo femoral ligament

The pubo femoral ligament is triangular in shape. Its base is attached to the ilio-pectineal eminence, superior ramus of the pubis, the obturator crest and obturator membrane. Distally it intermingles with the articular capsule of the hip joint and the medial band of the ilio femoral ligament.

Ligamentum capitis (teres) femoris

The ligament capitis femoris extends between the head of the femur and the acetabulum of the hip bone. It is a triangular flat band. Its apex is attached to the fovea capitis femoris. Its base is attached by two bands with either portion of the acetabular notch. It also blends with the transverse acetabular ligament. It is enclosed by the synovial membrane. The ligament is relaxed when the thigh is abducted and semi flexed the ligament becomes tense.

Acetabular labrum (glenoid labrum)

It is a strong band of fibro cartilage which is attached to the margin of the acetabulum and bridges over the acetabulum notch of the acetabulum as the transverse ligament. Thus it depends the acetabulum cavity so that the head of the femur can fit completely and remains in its place.

Transverse acetabular ligament

The transverse acetabular ligament is a portion of the acetabular labrum. It has strong fibres which cross the acetabular notch and convert it into foramen through which blood vessels and nerves enter the joint.

Q. What are the muscles related to the hip joint ?

The following muscles are related to the hip joint :—

Anteriorly.— (i) Psoas major. } Separated from the capsule by
(ii) Iliacus. } a bursa.

Posteriorly.— (i) Piriformis.
(ii) Gamellus superior.
(iii) Tendon of the obturator internus.
(iv) Gamellus inferior.
(v) Tendon of the obturator externus.
(vi) Quadratus femoris.

Proximally.— (i) Reflected head of the rectus femoris.
(ii) Insertion of gluteus minimus.

Medially.— (i) Obturator externus.
(ii) Pectineus.

Q. What are the arteries and the nerves supplying the hip joint ?

The following arteries and nerves supply the hip joint :—

Arteries

The following arteries supplying the hip joint are derived from :—

- (i) Obturator.
- (ii) Medial femoral circumflex.
- (iii) Superior and inferior gluteal vessels.

Nerves

The nerves are the articular branches from :

- (i) Sacral plexus.
- (ii) Sciatica nerve.
- (iii) Obturator nerve.

- (iv) Accessory obturator nerve.
- (v) Filament from the branch of the femoral nerve supplying the rectus femoris.

Q. What are the movements of the hip joint and what muscles take part in the movements ?

Movements of the joint

The following are the movements of the hip joint :

- (i) Flexion.
- (ii) Extension.
- (iii) Adduction.
- (iv) Abduction.
- (v) Circumduction.
- (vi) Rotation.

Muscles take part in the movements

The following are the muscles which take part in different movements :—

- Flexion.**— (i) Psoas major.
 (Flexes the femur on the pelvis). (ii) Iliacus.
 (iii) Pectineus.
 (iv) Rectus femoris
 (v) Sartorius.
 (vi) Adductors longus and brevis.
 (vii) Anterior fibres of the glutei medius and minimus.
 (viii) Tensor fasciae latae.
- Extension.**— (i) Gluteus maximus.
 (ii) Biceps femoris.
 (iii) Semi tendinosus.
 (iv) Semi membranousus.
- Adduction.**— (i) Adductores magnus, longus and brevis.
 (ii) Pectineus.
 (iii) Gracilis.
- Abduction.**— (i) Gluteus medius.
 (ii) Gluteus minimus.
- Rotation inwards.**— (i) Gluteus minimus. .
 (ii) Anterior fibres of the gluteus medius.
 (iii) Tensor fasciae latae.
 (iv) Adductores longus, brevis and magnus.
 (v) Pectineus.

- (vi) Iliacus.
 - (vii) Psoas major.
- Rotation outwards.**—(i) Posterior fibres of the gluteus medius.
- (ii) Piriformis.
 - (iii) Obturatores externus and internus.
 - (iv) Gemelli superior and inferior.
 - (v) Quadratus femoris.
 - (vi) Gluteus maximus.
 - (vii) Sartorius.

Knee Joint

Q. Describe the knee joint.

The knee joint is formally described as hinge joint but actually it is formed by three bones :—

- (i) Distal end of femur.
- (ii) Patella.
- (iii) Proximal end of the tibia.

These three bones take part in the formation of the knee joint. The condyles of the femur are separated from the condyles of the

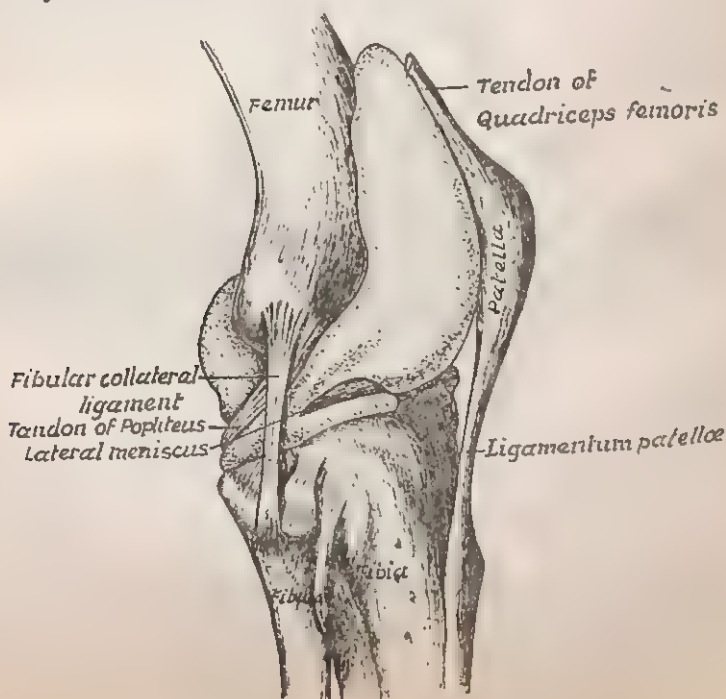


Fig. 16. Synovial stratum with ligaments of knee joint.

tibia by means of fibro-cartilage known as menisci (semi-lunar cartilages) which are present on the borders of the condyles of the tibia. There are also two strong bands inside the knee joint. These bands pass from the top of the tibia to the condyles of the femur and cross each other in such a way that it forms a letter "X" known as cruciate ligament of the knee joint. They also take main part in holding the femur and tibia together. These three bones—femur, tibia and patella are strengthened by :

Fibrous capsule,
Fibular collateral ligament,
Tibial collateral ligament,
Oblique popliteal ligament, and
Ligamentum patellae.

Following ligaments connect the bones :—

- (i) Articular capsule.
- (ii) Ligamentum patellae,
- (iii) Oblique popliteal.
- (iv) Arcuate popliteal.
- (v) Tibial collateral.

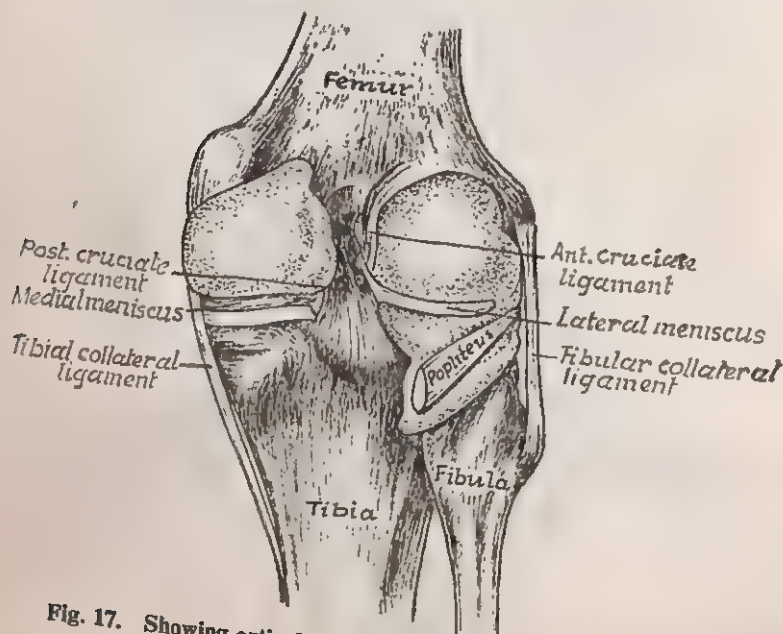


Fig. 17. Showing articular capsule with ligaments of knee joint.

- (vi) Fibular collateral.
- (vii) Anterior cruciate.
- (viii) Posterior cruciate.
- (ix) Medial and lateral menisci (Semi lunar cartilages)

- (x) Transverse.
- (xi) Coronary.

Articular capsule

The articular capsule of the knee joint at the back is a thin membrane. It is thick at the sides and absent in front where it is replaced by the patella and the ligamentum patellae below and the tendon of the Quadriceps femoris above the patella.

Its attachment to the femur is as follows :—

- (i) Condyles of the femur a little distance from the articular borders.
- (ii) Back of the femur along the inter-condylar line a little above the articular borders of the condyles.

Its attachment to the tibia is as follows :—

- (i) Posterior surface and the sides of the condyles near the articular borders.
- (ii) Anterior surface of the condyles of the tibia along the oblique line which begins near the anterior border.

The fibrous articular capsule is strengthened by various bands :

Anteriorly.—Ligamentum patellae.

Posteriorly.—Oblique popliteal ligament.

Medially.—Tibial collateral ligament.

Laterally.—Fibular collateral ligament.

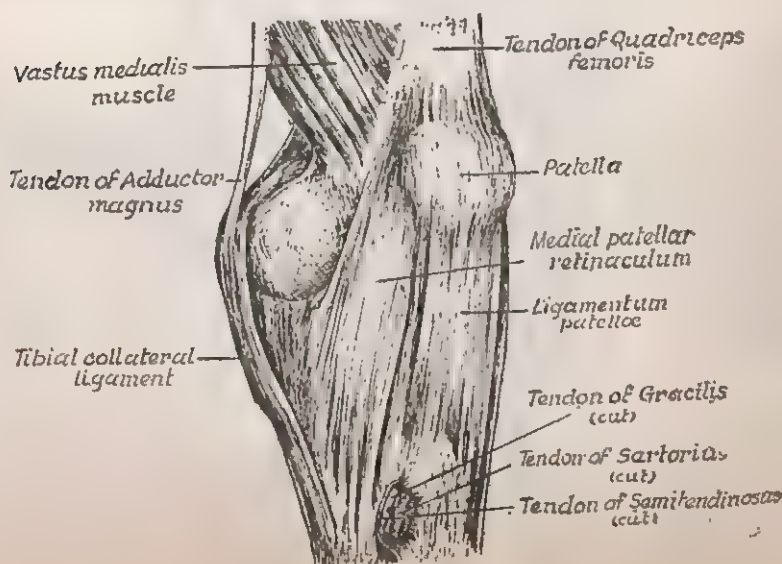


Fig. 18. Knee joint showing anteromedial aspect.

The articular capsule is strengthened by *facia latae* and *vasti* e.g. lateral and medial which blend with it. Such expansions from the *Vasti* is known as *patellar retinacula*.

Ligamentum patellae

The patellar ligament is strong and thick. It is attached proximally to the apex of the patella and also to the rough depression on its posterior surface. Distally, it is fixed to the smooth surface of the tuberosity of the tibia.

The deep surface of the upper portion of the patellar ligament is separated from the synovial membrane by means of fatty tissue known as the *inter-patellar pad of fat*.

The lower portion of the patellar ligament is separated from the anterior surface of the upper portion of the tibia by means of deep *intrapatellar bursa*.



Fig. 19. Knee joint showing posterior aspect.

Oblique popliteal ligament

The oblique popliteal ligament is a broad flat band. It is attached proximally to the border of the inter-condylar fossa and also

posterior surface of the femur near the articular borders of the condyles.

Distally it is attached to the posterior border of the head of the tibia.

Arcuate ligament

The arcuate ligament is a fibrous band. It passes from the lateral condyle of the femur to the posterior surface of the articular capsular ligament. It is also attached to the head of the fibula.

Tibial collateral ligament

The tibial collateral ligament is a long, flat band. It lies on the posterior portion of the knee joint. It is attached proximally to the medial condyle of the femur, a little below the adductor tubercle. Distally it is attached to the medial condyle and also to the upper portion of the medial surface of the body of the tibia. It blends with the fibrous capsule opposite the interval between the femur and the tibia.

The following muscles are related to the ligament :—

- (i) Tendon of the semi membranous.
- (ii) Sartorius.
- (iii) Gracilis.
- (iv) Semi tendinosus.

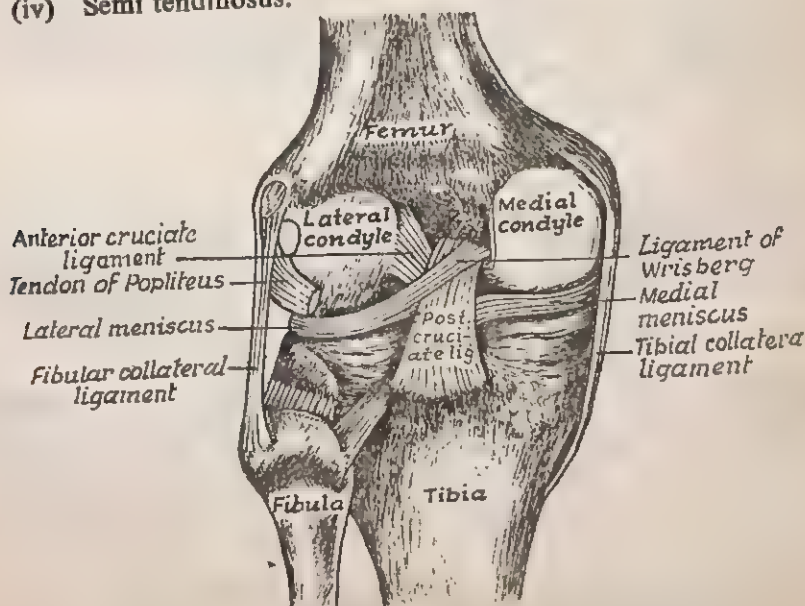


Fig. 20. Knee joint showing ligaments, cruciate ligaments and menisci.

The inferior medial genicular vessels and nerve run between the tibia and the lower portion of the ligament.

Fibular collateral ligament

The fibular collateral ligament is a strong round band. It is attached proximally to the posterior portion of the lateral condyle, above the groove for the tendon of the popliteus.

Distally it is attached to the head of the fibula anterior to the styloid process.

The following muscles are related to the ligament :—

- (i) Tendon of the biceps femoris.
- (ii) Tendon of the popliteus.

The inferior lateral genicular vessels and nerve lie deep to the ligament.

Cruciate ligaments

The cruciate ligaments are strong bands in the middle of the knee joint. They are situated more posterior of the joint than the anterior.

The ligament is called cruciate because they cross each other in such a way that they look like the letter 'X'.

They are anterior and posterior cruciate ligaments.

Anterior cruciate ligament

The anterior cruciate ligament is attached to the depression in front of the intercondylar eminence of the tibia. It runs upwards and lateralwards and is attached to the posterior portion of the medial surface of the lateral condyle of the femur.

Posterior cruciate ligament

The posterior cruciate ligament is a short and strong band. It springs from the posterior intercondylar fossa of the tibia. It also is attached to the posterior end of the lateral meniscus. It runs upwards and medialwards. It crosses obliquely the anterior cruciate ligament and gets its attachment to the anterior portion of the lateral surface of the medial condyle of femur.

Menisci (Semilunar fibro cartilages)

The menisci are two Creiscentic lamellae of fibro cartilage. They are situated on the condylar surfaces of the tibia. The menisci (semilunar cartilages) deepens the surfaces of the condylar fossae of the head of the tibia on which the condyles of the femur move. They are thick at the circumference of the joint. The lateral one is more thicker than the medial. Their surfaces are articular and smooth.

Lateral meniscus (lateral semilunar cartilage)

The lateral meniscus is almost circular. Its anterior end (horn) is attached in front of the intercondylar eminence of the tibia, lateral to the anterior cruciate ligament.

Its posterior end (horn) is attached to the intercondylar eminence of the tibia. It sends out a strong slip known as ligament of Wrisberg. It runs laterally and is inserted to the medial condyle of the femur, posterior to the attachment of the posterior cruciate ligament.

Medial meniscus

Its anterior end (horn) is fixed to the anterior intercondylar fossa of the tibia, anterior to the anterior cruciate ligament.

Its posterior end is attached to the posterior intercondylar fossa of the tibia and anterior to the attachment of the posterior cruciate ligament.

Transverse ligament

The transverse ligament is a fibrous band. It joins the anterior border of the lateral meniscus to the anterior end (horn) of the medial meniscus.

Coronary ligament

The coronary ligament is a portion of the articular capsule. It connects the periphery of each meniscus with the border of the head of the tibia.

Movements of Knee Joint

Q. What are the movements of the knee joint ? What muscles take part in the movements ?

The movements of the knee joint are as follows :—

- (i) Flexion.
- (ii) Extension.
- (iii) Medial rotation.
- (iv) Lateral rotation.

Muscles produce movements :—

Flexion.—(i) Biceps femoris.

(ii) Semi tendinosus.

(iii) Semi membranousus.

(iv) Gracilis.

(v) Sartorius.

(vi) Gastrocnemius.

(vii) Popliteus.

(viii) Plantaris.

Extension.—Quadriceps femoris.

Rotation.—(i) Popliteus.

Medially. (ii) Semi tendinosus.

(iii) Semi membranousus.

(iv) Sartorius.

(v) Gracilis.

Rotation.—Biceps femoris.**Laterally.**

Arteries and Nerve

Q. What are the arteries and nerve supplying the joint?

The following are the arteries and nerve supplying the knee joint :—

- Arteries.**—(i) Descending genicular, a branch of the femoral.
 (ii) Genicular branches of the popliteal.
 (iii) Recurrent branches of the anterior tibial.
 (iv) Descending branch from the lateral femoral circumflex of the profunda femoris.

Nerves

Nerves are derived from :—

- (i) Obturator.
 (ii) Femoral.
 (iii) Tibial.
 (iv) Common peroneal.

Structures Around the Knee Joint

Q. Mention the structures around the knee joint.

The following structures surround the knee joint :—

Anteriorly.—Quadriceps femoris.

- Posteriorly.**—(i) Popliteus.
 (ii) Plantaris.
 (iii) Medial head of gastrocnemius.
 (iv) Lateral head of gastrocnemius.
 (v) Popliteal vessels.

} Muscles

(vi) Tibial nerve.

(vii) Lymph nodes and fats.

Laterally.—(i) Tendon of Biceps femoris.

(ii) Popliteus.

(iii) Common Peroneal nerve.

Medially.—(i) Sartorius.

(ii) Gracilis.

(iii) Semi tendinosus.

(iv) Semi membranousus.

Q. What are the bursae present near the knee joint ? Mention them.

The following bursae are present near the knee joint :—

Anteriorly.—Four bursae are present anteriorly viz. :—

- (i) Between the patellae and the skin.
- (ii) Between the upper part of the tibia and the ligamentum patellae.
- (iii) Between the lower portion of the tuberosity of the tibia and the skin.
- (iv) Between the anterior surface of the lower portion of the femur and the deep surface of the Quadriceps femoris.

Laterally.—Four bursae are present on the lateral side of the joint :—

- (i) Between the lateral head of the gastrocnemius and the articular capsule
- (ii) Between the fibular collateral ligament and the tendon of the biceps femoris.
- (iii) Between the fibular collateral ligament and the tendon of the popliteus.
- (iv) Between the tendon of popliteus and the lateral condyle of the femur.

Medially.—Five bursae are present on the medial side of the knee joint :

- (i) Between the medial head of the gastrocnemius and the articular capsule.
- (ii) Between superficial to the tibial collateral ligament and the tendon of the semi-membranosus.
- (iii) Between deep to the tibial collateral ligament and the tendon of the semi-membranosus.
- (iv) Between the tendon of the semi-membranosus and the head of the tibia.
- (v) Between the tendons of the semi-membranosus and the semi-tendinosus.

Anastomosis Round the Knee Joint

Q. Describe the anastomosis around the knee joint.

Arterial anastomosis takes place around the lower end of the femur and the upper end of the tibia above the patella.

The superficial anastomosis lies between the fascia and the skin around the patella. Three distinct arches are present. The first arch lies above the patella in the superficial fibres of the Quadriceps femoris. The second arch lies under the cover of the ligamentum patellae just below the patella. The third arch lies on the tibia just above the insertion of the ligamentum patellae. The

anastomosis are numerous on the anterior surface and the sides of the knee.

The deep net work of the arteries is situated on the lower end of the femur and the upper end of the tibia around the knee joint and gives out branches to the soft parts covering the joint, the bones, the ligaments and the synovial membrane. Its largest branch enters the bones and supplies the marrow.

N.B.—Arterial anastomosis around the knee joint. *See* page 218.

The following arteries take part in anastomosis around the knee joint :—

- (i) Medial superior genicular.
- (ii) Lateral superior genicular.
- (iii) Medial inferior genicular.
- (iv) Lateral inferior genicular.
- (v) Highest genicular.
- (vi) Descending branch of the lateral femoral circumflex.
- (vii) Fibular.
- (viii) Anterior tibial recurrent.

Medial superior genicular artery

The medial superior genicular artery springs from the popliteal artery, winding round the femur above the medial condyle in front of the knee joint. It passes in front of the semimembranous and the semitendinous, above the medial head of the gastrocnemius. Then it runs deep to the adductor magnus where it divides into two branches. The one anastomoses with the highest genicular and the medial inferior genicular arteries after supplying the vastus medialis, the other anastomoses with the lateral superior genicular artery, ramifying on the surface of the femur.

Lateral superior genicular artery

The lateral superior genicular artery springs from the popliteal artery, winding round the femur above the lateral condyle to the front of the knee joint. It passes beneath the tendon of the biceps femoris. It divides into two branches—superficial and deep.

Superficial branch

The superficial branch of the lateral genicular artery anastomoses with the descending branch of the lateral femoral circumflex artery and with the lateral inferior genicular artery after supplying the vastus lateralis.

Deep branch

The deep branch of the lateral superior genicular artery anastomoses with the medial superior genicular artery and the highest genicular artery, forming an arch in front of the femur.

Medial inferior genicular artery

The medial inferior genicular artery springs from the popliteal artery below the head of the gastrocnemius. It runs along the upper border of the popliteus and then passes below the medial condyle of the tibia behind the tibial collateral ligament. It then goes upwards to the front and medial side of the knee joint, and anastomoses with the lateral inferior genicular artery and the medial superior genicular artery. It supplies the knee joint and the upper end of tibia.

Lateral inferior genicular artery

The lateral inferior genicular artery springs from the popliteal artery below the lateral head of the gastrocnemius. It passes lateralwards crossing the popliteus muscle and runs above the head of the fibula to the anterior surface of the knee joint. During its course it passes behind the lateral head of the gastrocnemius, the fibular collateral ligament and the tendon of the biceps femoris. It gives out branches which anastomoses with the medial inferior genicular, the lateral superior genicular, and the anterior tibial recurrent arteries.

Highest genicular artery

The highest genicular artery springs from the femoral artery just before the femoral artery enters the adductor canal. It divides into saphenous and the musculo-articular branches.

Saphenous branch

The saphenous branch accompanies the saphenous nerve after piercing the roof of the adductor canal to the medial side of the knee. It runs between the sartorius muscles and the gracilis muscles and anastomoses with the medial inferior genicular artery.

Musculo-articular branch

The musculo-articular branch runs in the substance of the vastus medialis and then passes in front of the adductor magnus to the medial side of the knee joint. Here it anastomoses with the medial superior genicular artery and the anterior tibial recurrent artery.

Fibular artery

The fibular artery springs from the posterior tibial artery. It runs lateralwards round the neck of the fibula passing through the soleus. It anastomoses with the lateral inferior genicular artery.

Descending branch of the lateral femoral circumflex artery

The descending branch of the lateral femoral circumflex artery springs from the arteria profunda femoris. It anastomoses with the superior lateral genicular artery, a branch of the popliteal artery.

Anterior tibial recurrent artery

The anterior tibial recurrent artery arises from the anterior tibial artery. It runs on the tibialis anterior muscle and anastomoses with the genicular branches of the popliteal artery and the highest genicular artery and ramifies on the front and the sides of the knee joint forming the patellar net work.

Ankle Joint**Q. Describe the ankle joint.**

The ankle joint is a hinge joint. It is formed by three bones viz. talus, (upper medial and lateral surfaces), the lower end of tibia



Fig. 21. Ankle joint showing ligaments on the lateral aspect.

and the lower end of fibula. A deep hollow is formed by these bones with the upper surface of the talus and is strengthened by the transverse tibio-fibular ligament.

The following ligaments connect the bones of the ankle joint :—

1. Articular capsule.
2. Deltoid or Medial.
3. Anterior talo-fibular.
4. Posterior talo-fibular.
5. Calcaneo-fibular.

Articular capsule

The articular capsule is a fibrous capsule of the ankle joint. It is attached above to the borders of the articular surfaces of the tibia and malleoli. Below it is attached to the talus around its articular surface. The anterior portion of the capsule is known as anterior ligament. It is thin membrane and is attached above to the front of the lower end of the tibia. Below it is attached to the talus.

The posterior portion of the capsule is known as the posterior ligament. It is also thin. It is attached above to the border of the

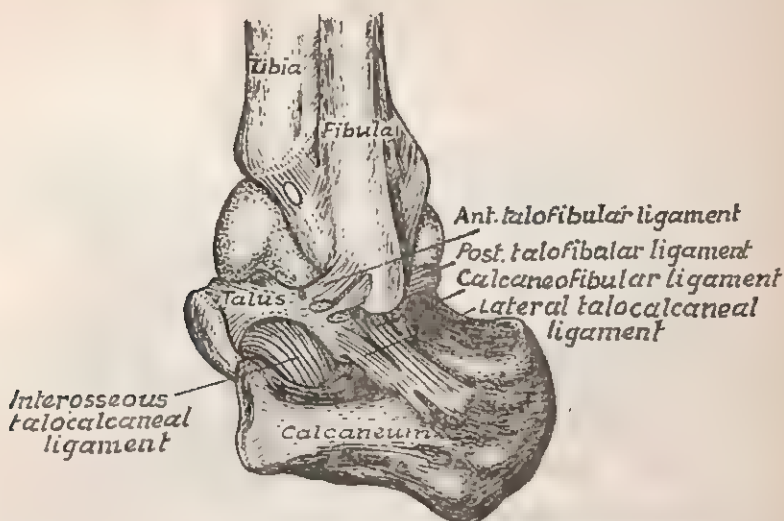


Fig. 22. Ankle joint showing lateral aspect.

articular surface of the tibia. Below it is attached to the articular surface of the talus. Laterally it is attached to the medial surface of the lateral malleolus.

The anterior portion of the capsule is in relation with the following structures :—

1. Extensor tendons of toes.
2. Tendon of tibialis anterior.
3. Peroneus tertius.
4. Anterior tibial vessels.
5. Deep Peroneal nerve.

Deltoid ligament or medial ligament

The deltoid or medial ligament is a thick triangular ligament. Above, it is attached to the apex and anterior and posterior margins of the medial malleolus. Below, it is attached to the tuberosity of the navicular bone, medial margin of the plantar calcaneo navicular ligament, sustentaculum tali of the calcaneus. The ligament is surrounded by the tendons of the tibialis posterior and flexor digitorum longus.

Anterior talo-fibular ligament

The anterior talo-fibular ligament is short and flat band. It is attached above to the anterior border of the lateral malleolus. Below it is attached to the talus.

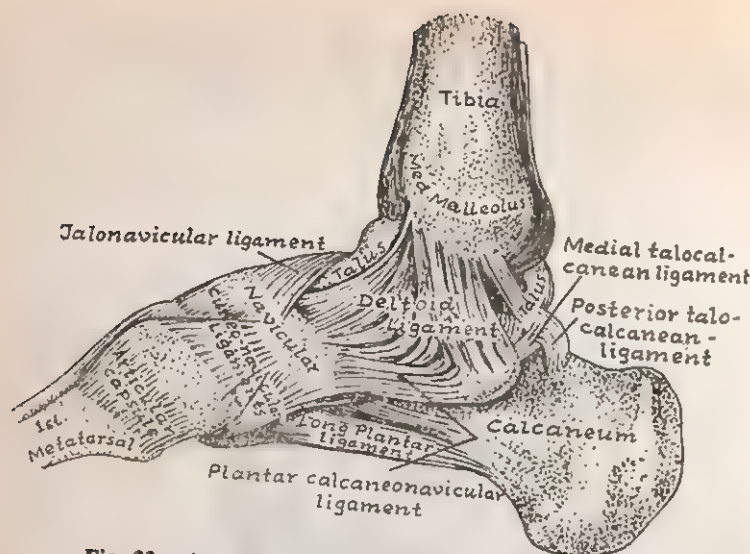


Fig. 23. Ankle joint showing ligaments on medial aspect.

Posterior talo-fibular ligament

The posterior talo-fibular ligament is a strong band. It is attached above to the depression of the lateral malleolus. Below it is attached to the posterior tubercle of the talus. It runs horizontally.

Calcaneo-fibular ligament

The calcaneo-fibular ligament is round and strong band. It is

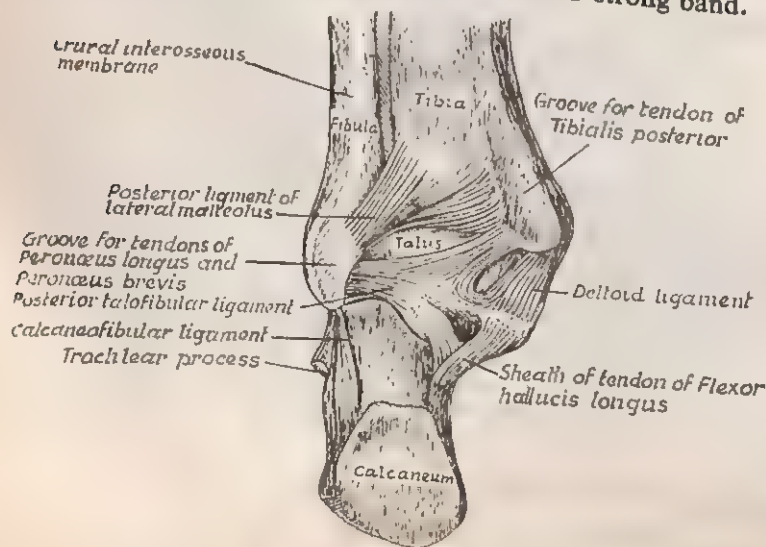


Fig. 24. Ankle joint showing posterior aspect.

attached above to the apex of the lateral malleolus. Below, it is attached to the lateral surface of the calcaneus.

These three above ligaments (viz. Anterior and posterior talo-fibular and calcaneo-fibular ligaments) are known as the external lateral ligament of the ankle joint.

Synovial membrane

The synovial membrane covers the deep surfaces of the capsular ligament and small processes project in between the distal end of the tibia and fibula.

Q. What are the arteries and nerves supplying the ankle joint ?

The following arteries supply the joint :—

- Arteries.**—(i) Malleolar branches of the anterior tibial.
(ii) Branches from the peroneal artery.

The following nerves supply the ankle joint :—

- Nerves.**—(i) Deep peroneal nerve.
(ii) Tibial nerve.

Q. What are the structures related to the portion of the ankle joint ?

The following structures are related anteriorly to the ankle joint :—

- (i) Tibialis anterior.
- (ii) Extensor hallucis longus.
- (iii) Anterior tibial vessels.
- (iv) Deep peroneal nerve.
- (v) Extensor digitorum longus.
- (vi) Peroneus tertius.

On the anterior surface of the ankle joint, the anterior tibial vessels and deep peroneal nerve lie in between the extensor hallucis longus and the extensor digitorum longus.

The following structures are related posteriorly :—

- (i) Tibialis posterior.
- (ii) Flexor digitorum longus.
- (iii) Posterior tibial vessels.
- (iv) Tibial nerve.
- (v) Flexor hallucis longus.

On the fibular side, the per onei longus and brevis, lie superficial to the calcaneo-fibular ligament, whereas on the tibial side, the tendons of the tibialis posterior and flexor digitorum longus cross the deltoid (medial) ligament superficially.

On the posterior surface of the ankle joint, the posterior tibial vessels and tibial nerve lie between the flexor digitorum longus and the flexor hallucis longus.

Q. What are the muscles that take part in the movements of the ankle joint? Mention its immediate relation.

The only movements of the ankle-joint are dorsiflexion and extension or planter flexion. Dorsiflexion of the ankle joint means the dorsum of the foot to the front of the leg.

The following muscles take part in the movement of the dorsiflexion :—

Dorsiflexion

- (i) *Tibialis anterior.*
- (ii) *Extensor hallucis longus.*
- (iii) *Extensor digitorum longus.*
- (iv) *Peroneus tertius.*

Planter flexion of the ankle joint means the heel of the foot is drawn up and the toes pointed downwards.

The following muscles take part in the movement of the extension or plantar flexion :—

- (i) *Gastronemius (chief-muscle)*
- (ii) *Soleus.*
- (iii) *Plantaris.*
- (iv) *Tibialis posterior.*
- (v) *Flexor digitorum longus.*
- (vi) *Flexor hallucis longus.*

} Less degree muscles.

Immediate relation of the ankle joint

The tendons of the muscles, the arteries, the veins, the nerves are in relation with the ankle joint :

Anterior relation

From the tibial to the fibular side are as follows :—

- (i) *Tibialis anterior.*
- (ii) *Extensor hallucis longus.*
- (iii) *Anterior tibial vessels.*
- (iv) *Anterior tibial nerve (Deep peroneal nerve).*
- (v) *Extensor digitorum longus.*
- (vi) *Peroneus tertius.*

On the anterior surface of the ankle joint, the anterior tibial vessels and deep peroneal nerve lie between the extensor hallucis longus and extensor digitorum longus.

Posterior relation

From the tibial to the fibular side are as follows :—

- (i) *Tibialis posterior.*
- (ii) *Flexor digitorum longus.*
- (iii) *Posterior tibial artery.*

- (iv) Tibial nerve.
- (v) Flexor hallucis longus.

On the posterior surface of the ankle joint, the posterior tibial vessels and tibial nerve lie between the flexor digitorum longus and the flexor hallucis longus.

On the fibular side, the peroneus longus and the peroneus brevis lie superficial to the calcano-fibular ligament, whereas on the tibial side the tendons of the tibialis posterior and the flexor digitorum longus cross the deltoid (Medial) ligament superficially.

Q. Describe the anastomosis around the ankle joint.

The anastomosis of the arteries take place around the ankle joint as indicated below.

On the lateral side of the ankle joint, the following arteries take part in anastomosing around the ankle joint :—

- (i) Lateral malleolar.
- (ii) Perforating branch of peroneal.
- (iii) Terminal part of peroneal.
- (iv) Lateral tarsal.

On the medial side of the ankle joint, the following arteries take part in anastomosing the ankle joint :—

- (i) Medial malleolar branch of the anterior tibial.
- (ii) Small twigs from the medial calcaneal branches of the posterior tibial.

GLOSSARY

- Abdomen** —The largest cavity of the body lying between the thorax and the pelvis.
- Abduct** —To draw away from the middle line.
- Abduction** —A muscle drawing away from the middle on line contraction.
- Acetabulum.** —A cup-shaped socket on the external surface of the hip bone.
- Achilles tendon.** —Insertion of the tendinous termination of the soleus and gastrocnemius to the calcaneum bone.
- Acromion** —The triangular process at the outer end of the spine of the scapula, the summit of the shoulder.
- Action** —Function of any portion of the body.
- Acoustic** —Relating to sound or hearing.
- Adduct** —To draw towards the middle line.
- Adduction** —A muscle drawing towards the middle line on contraction.
- Adipose** —Fat.
- Aditus** —An opening.
- Afferent** —Conveying to the centre.
- Ala** —Any wing like process.
- Alveolus** —Any air-vesicle of the lung, tooth-socket.
- Ampulla** —A flask-like dilatation.
- Anastomosis** —Communication of the branches of the vessels with each other.
- Anatomy** —The science which deals with the structure of the body by means of dissection.
- Ansa** —A loop.
- Anterior** —Relating to the front of the body or the extremities.
- Anti-flexion** —Forward bending of an organ.
- Antrum** —A cavity, a cave.
- Anti-version** —Forward displacement of an organ.
- Aponeurosis** —A wide shining tendinous sheet of tissue covering the muscles.
- Appendix** —An appendage.
- Arch** —A curve or loop.
- Atrium** —One of the two upper cavities of the heart.

- Auditory** —Relating to the sense of hearing.
Aural —Relating to the ear.
Auricle —Pinna of the external ear. An appendage to the cardia-atrium.
Azygos —Unpaired, singly.
Bartholin's glands. —Two small glands situated at each side of the external orific of the vagina.
Basilar —Belonging to the base.
Basion —The midpoint of the anterior margin of the foramen magnum.
Biceps —A muscle with two heads of origin.
Bicuspid —Having two cusps.
Brachial —Relating to the arm.
Bregma —Meeting of the coronal and sigital sutures. Anterior fontanelle.
Brevis —Short.
Buxinator —The muscle used in blowing a trumpet.
Capitulum —Small rounded projection at the lower end of the humerus.
Capillary —A vessel of hair like dimension.
Capitate —Having a head.
Carpus —The wrist.
Cauda —A tail like appearance.
Cavernous —Full of cavities.
Cerebellum —The small brain.
Cerebrum —Upper larger portion of the brain.
Cervix —The neck.
Cervical —Relating to the neck.
Choroid —Like a membrane.
Chordae tendinae. —Fine white tendinous threads joining the papillary muscles of the heart with the valves.
Condyle —Rounded eminence at the articular end of a bone.
Coronal suture —Transverse line of meeting between the frontal and parietal bones.
Coronary —Crown-like, encirclement of a vessel or nerve, encircling.
Coronoid —Carved, like the beak of a sea crow.
Corrugator —A wrinkler.
Cranium —The skull.
Cremaster —A suspender.
Cricoid —Like a ring.
Crista —A crest.

- Cruciate —A cross-like shaped.
 Crural —Relating to the leg.
 Crus —Root-like structure, a leg.
 Cupola —A dome.
 Dacryon —The meeting point of the lacrimal, frontal and the frontal process of the maxillary bones.
 Deferens —Carrying away.
 Diaphragm —A dome-shaped muscular partition between the thorax above and abdomen below, 'a partition'.
 Distal —Furtherest from head or Centre.
 Dorsal —Relating to the posterior aspect of the body and extensor aspects of the extremities.
 Dorsum —The back.
 Dura —Tough.
 Duramater —Tough membrane of the meninges surrounding the brain.
 Efferent —Conveying away from the Centre, carrying out.
 Encephalon —The brain.
 Epoophoron —Above the egg bearing organ, above the ovary.
 Extensor —A muscle extending on contraction or straightening the flexed limb.
 Extension —Straightening of the flexed limb.
 External —Relating to the outside.
 Facet —Smooth, a small plane surface.
 Falx —Sickle-shaped structure.
 Fissure —A cleft or slit.
 Fenestra —A window.
 Flex —Bend.
 Flexion —Bending.
 Flexor —A muscle bending the limb on contraction.
 Fossa —A ditch or trench.
 Fovea —A small pit.
 Galea —A helmet.
 Genio —Relating to the chin.
 Genu —A knee.
 Glabella —The mid-point between the superciliary arches.
 Glosso —Relating to the tongue.
 Gluteal —Relating to the buttock.
 Gyrus —A ring or circle.
 Hallux —The great toe.
 Hemi —Half.

- Hemiazygos** —Half unpaired.
Hepar —Liver.
Hiatus —Opening.
Horizontal —Relating to the planes at right angles to vertical plane
Hypothenor —Beneath the palm of the hand.
Infundibulum—Funnel shaped passage.
Inguinal —Relating to groin.
Inion —The back of the head, the external occipital protuberance.
Insertion —The end of a skeletal muscle moving on contraction.
Jugal —The junction of the frontal and temporal processes of the zygomatic bone.
Labium —A lip-like fold.
Lacrimal —Relating to tears.
Lambda —Union of the sagittal and lamboid sutures, Union between the occipital and parietal bones.
Lateral —External, outer, structures away from the median plane.
Lien —Spleen.
Linea —A line.
Longitudinal. —Relating to the long axis of the body.
Lingual —Relating to the tongue.
Masseter —The chewing muscle.
Mamma —Breast.
Mandible —The lower jaw.
Medial —Structures nearer to the median line, near the middle line.
Median —Relating to the median vertical antero-posterior plane of the body.
Mediastinum. —A partition.
Mental —Relating to the chin.
Myocardium—Heart muscle.
Naris —Nostril.
Nasal —Relating to the nose.
Obelion —The point on the sagittal suture opposite the parietal foramen.
Ocular —Relating to the eye.
Omentum —Fold of peritoneum.
Orbit —A circle.

- Origin —The end of a skeletal muscle remaining fixed on contraction-source.
- Otic —Relating to the ear.
- Pedis —Great toe, hallux.
- Phrenic —Relating to the diaphragm.
- Plantar —Relating to the sole of the foot.
- Pollex —Thumb.
- Prone —Palm downwards, face downwards.
- Pronate —To turn the palm downwards, to lie on face.
- Pronation —A muscle turning the palm downwards on contraction.
- Proximal —Relating nearer to the attached end.
- Prosthion —The mid point of the alveolar margin of the maxilla.
- Pterion —The meeting of the frontal, parietal, temporal and great wing of the sphenoid bones.
- Pterygoid —Winglike.
- Quadratus —Square.
- Quadriceps —Four headed.
- Ramus —A branch.
- Renal —Relating to the kidney.
- Rhinion —The lower extremity of the inter-nasal suture.
- Sagital —Vertical antero-posterior planes, resembling an arrow.
- Saphenous —Apparent.
- Spermatic —Scale-like, scaly.
- Supine —Palm upwards, lying back with face upwards.
- Supination —A muscle turning the palm of the hand upwards on contraction.
- Supra —Above.
- Sural —Relating to the calf of the leg.
- Testis —Testicle.
- Thenar —Palm of the hand
- Thorax —Chest cavity.
- Trachea —A wind pipe.
- Triceps —A muscle with three heads of origin.
- Trigeminal —Triple.
- Tunica —A lining membrane.
- Umbilicus —Naval, abdominal scar present after separation of the umbilical cord.
- Urethra —A canal through which the urine is passed.
- Uterus —Womb.
- Vagina —A sheath.

Vastus	—Large.
Ventral	—Relating to the abdomen or anterior surface of the body.
Verni- form.	—A worm like.
Vertex	—The summit.
Volar	—Relating the palm of the hand.
Xiphoid	—Like a sword.
Zygoma	—Cheek bone.

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